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WILSON (J. D.). **New equipment and new materials for controlling vegetable diseases.**—*Proc. Ohio Veg. Potato Grs' Ass.*, xxiv, pp. 110–134, 1939. [Abs. in *Exp. Sta. Rec.*, lxxxi, 5, p. 663, 1939.]

Experiments are described to determine the comparative efficiency in the control of certain vegetable diseases in Ohio of Bordeaux mixture and various insoluble copper compounds. Both 4–4–50 and 4–2–50 Bordeaux and coposil [*R.A.M.*, xviii, p. 785] caused considerable injury on young tomato plants. The stronger Bordeaux and Grasselli copper compound A were most effective against anthracnose [*Colletotrichum phomoides*] of the tomato canning crop [ibid., xviii, pp. 658, 725]. Postponement of spraying until leaf spot (*Septoria*) [*lycopersici*: ibid., xviii, p. 421] appeared gave fair control of the disease and augmented yields. Bacterial wilt of cucumbers [*Erwinia tracheiphila*: ibid., xv, p. 197] yielded more readily to mixtures containing an insoluble copper as an ingredient than to those lacking this element. In the case of muskmelons cupro-K gave the best results on the basis of saleable fruits. For economic reasons the substitution of insoluble coppers for Bordeaux mixture cannot be advocated, despite the fungicidal efficiency of the former, for the control of potato, bean [*Phaseolus vulgaris*], celery, and carrot diseases.

LARSON (R. H.) & WALKER (J. C.). **A mosaic disease of Cabbage.**—*J. agric. Res.*, lix, 5, pp. 367–392, 15 figs., 1939.

This is an expanded account of the authors' study on the extremely destructive cabbage mosaic in south-eastern Wisconsin, a preliminary report of which has already been noticed from another source [*R.A.M.*, xiv, p. 414; xvii, p. 426]. The disease is regarded as distinct from the cauliflower mosaic described by Tompkins [ibid., xvii, p. 6]. The first symptoms to appear are a slight yellowing and a clearing of the veins, usually beginning at the distal portion of the leaf, followed by mottling and more distinct vein-clearing. The later symptoms vary considerably. Commonly a slight veinbanding and savoying of the leaf lamina occurs. The normal production of leaf bloom is retarded, and as infected leaves become older, necrotic spots, usually 1 to 3 mm. in diameter, sunken, and blue-black, appear on or along the veins and in the parenchyma. The savoying of the interveinal tissue, usually a deeper green than normal, is often followed by twisting or curling of the midrib. In the field the symptoms are very varied and are often masked effectively. Growth may be stunted without any signs of

mottle or necrosis, and the outer leaves are inclined to be more erect and to clasp the head more tightly than is normal. Premature leaf drop is one of the most destructive phases of the disease. Less frequent is head necrosis, which develops at the maturity of the plant in the field or later in storage or transit, and is either confined to a few outer head leaves or scattered throughout the head. The necrotic spots are small, sunken, brown to black, and are most numerous in the interveinal tissue. In storage premature formation of the petiole absciss layer often renders the heads worthless for market.

Pieris rapae is recorded as an additional vector. *Brevicoryne brassicae* picked up the virus in 30 minutes and transmitted it to healthy plants after 30 minutes' feeding, the corresponding times for *Myzus persicae* being 1 hour and 30 minutes, respectively. The virus can also be transmitted mechanically with the aid of carborundum as an abrasive. Drying inactivates the virus. The disease is most severe at temperatures of 24° to 28° C., within which range stunting and necrosis occur, but no symptoms develop on new foliage of infected plants held at 16° or lower. Overwintered infected cruciferous weeds are an important source of inoculum.

Rodighin (M. [N.]). О редкой болезни Тыквы и Кабачков, вызываемой **Ascochyta citrullina (C. O. Smith) Gross.** [On a rare disease of Vegetable Marrow and Italian Marrow, caused by *Ascochyta citrullina* (C. O. Smith) Gross.]—'25 years Saratoff Agricultural Institute', Saratoff, pp. 191–194, 1939.

Ascochyta citrullina (the conidial stage of *Mycosphaerella citrullina*) [*R.A.M.*, xiv, p. 182] was observed in 1935 causing a blackening and wilting of the fruits of vegetable marrow and Italian marrow in fields near Saratoff. This is the first record of this fungus in the U.S.S.R.

Branas (J.). **Chronique. Sur le congrès de Bad-Kreuznach.** [Current notes. On the Congress of Bad-Kreuznach.]—*Progr. agric. vitic.*, cxii, 37, pp. 202–204, 1939.

At the international congress of viticulture held at Bad-Kreuznach in 1939, F. Stellwaag, A. Jöhnssen, and J. Branas agreed that the disease known in Germany as 'reisigkrankheit' is identical with court-noué as understood at Montpellier and defined by Ravaz [*R.A.M.*, xviii, p. 652].

Objections to the author's view [that the disease is of virus origin and is transmitted mainly by *Phylloxera vastatrix* f. *radicicola*] were raised by Faës of Lausanne and Börner of Naumburg a.d. Saale. The former pointed out that the simultaneous appearance of the disease over large areas is incompatible with insect transmission, which is necessarily slow; he also expressed the view that subterranean biting insects cannot act as vectors of filterable viruses. The latter stated that the insects do not readily leave a root once established on it, and therefore can hardly be responsible for transmission. The author contends, however, that the disease can be spread by the vines themselves, that no proof is forthcoming of the alleged inability of the insects to act as vectors, and that they do in fact leave the roots when these are cut or dug up.

MARSAIS (P.) & SÉGAL (L.). **Le court-noué contagieux a-t-il les caractères d'une maladie à virus?** [Has contagious court-noué the characters of a virus disease?]—*Rev. Vitic., Paris*, xci, 2, 360, 2361, pp. 257–264, 1939.

The authors state that they regard vine court-noué [see preceding abstract] as a degeneration disease. The shortening of the internodes is the outward manifestation of a physiological unbalance which may be caused by widely different physical, chemical, or pathogenic agencies. This symptom may be accompanied by bushiness of the shoots (reisigkrankheit), leaf denticulation (roncet), chlorotic leaf mottle (mosaic), black striation of branches and leaves (mal nero), and pith decomposition (pith disease). In other words, court-noué is not so much a disease as a symptom.

With regard to the suggested virus origin of court-noué, the authors consider this hypothesis is unsupported by a single experimental fact. Some of the symptoms, it is true, resemble those of a virus disease, but the presence of the endocellular cordons would not indicate a condition of this nature. The view that the disease is not present in localities where *Phylloxera* [*vastatrix* f. *radicicola*] is rare or absent, such as vineyards subject to flooding [*R.A.M.*, xvii, p. 793], is not supported by the authors' observations, which showed the disease to be characteristically present in an ungrafted vineyard near Narbonne subject annually to flooding. The authors conclude that court-noué is probably caused by some parasite in the tissues or pith that has so far escaped observation.

BARRETT (J. T.). **Overwintering mycelium of Plasmopara viticola (B. & C.) Berl. & De T. in the California wild Grape, Vitis californica Benth.**—Abs. in *Phytopathology*, xxix, 9, pp. 822–823, 1939.

The mycelium of *Plasmopara viticola* is stated regularly to overwinter in the cortical tissues and cane buds of *Vitis californica* in California, thereby perpetuating infection by downy mildew. Shoots arising from diseased buds are noticeably more vigorous than those from non-infected (up to 2½ times longer and twice the diameter at the base), with abnormally pale leaves and stems. The mycelium can easily be detected microscopically in the parenchyma of all organs, even to the very tips of the growing points. In nature sporangiophores have been observed only on the leaves, where they first appear along the veins on the under side. Except for the foliage, the infected parts are seldom killed. The leaf spots due to secondary infection are scattered at random, rapidly turning first yellow and then brown. Cultivated grapes, even in close proximity to diseased wild ones, do not seem to contract downy mildew from this source.

SMALL (T.). **Report of the Mycologist.**—*Rapp. aux États de Jersey, 1938*, pp. 21–35, 1939.

This report [cf. *R.A.M.*, xvi, p. 514; xvii, p. 621] contains, among others, the following items of interest. During 1938, potato blight (*Phytophthora infestans*) was almost entirely absent. When freshly dug, healthy potatoes were inoculated with a spore suspension of *P. infestans* and covered with soil in the ridges among the crop, 22 out of 30 were

diseased four days later, though infection was not conspicuous enough to be detected in ordinary digging; seven days after inoculation 29 showed advanced infection. In another test, no disease was apparent three days after inoculation, while after six days, 16 out of 30 tubers were diseased, only five of which would ordinarily have been detected. These results indicate how long to postpone digging a diseased crop [after killing the haulm] in order that infected tubers may be recognized and discarded when dug.

In Jersey, *Corticium solani* is very prevalent on seed potatoes, but seldom causes enough loss to deserve attention. In 1938, however, when exceptionally dry weather prevailed, two serious outbreaks occurred, involving the loss of five vergées of early potatoes.

Tomato stem rot (*Didymella lycopersici*) [ibid., xvi, p. 514] caused heavy losses in several fields. In one instance, the total value of the crop from 10,000 plants was 8*s*., and in another 30,000 plants yielded only 12½ tons. In several instances plants raised in sterilized soil became infected when planted out in fields not previously planted to tomatoes. In experiments on seed transmission [ibid., xviii, p. 636], seed from diseased fruits and seed inoculated with the fungus occasionally yielded a diseased seedling. Experimental evidence showed that the spores are carried by wind and rain and on pruning knives, and that the fungus may spread slowly through the soil. Seedlings were much less prone to attack than field crops. On outdoor crops, at least one month (often two months) elapsed between inoculation and wilting. The fungus remained viable for nine months on tomato stems stored out of doors.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1938.** [Review of phytopathological records noted in 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 2, pp. 115–188, 16 figs., 1939.

This report [cf. *R.A.M.*, xvii, p. 727] contains numerous items of phytopathological interest, of which the following may be mentioned. Apple fruits were attacked by *Sclerotinia fructigena* [ibid., xvi, p. 230] and those of quince by *S. linhartiana* [ibid., xvii, p. 589], young peach trees (at the collar) by a *Phytophthora* probably very close to *P. cactorum* [cf. ibid., xv, p. 34], and young walnuts by *P. cambivora* or a fungus closely allied to it [ibid., xvi, p. 588]. *Pinus pinaster* was widely infected by *Peridermium cornui* [ibid., xviii, p. 73]. Favoured by exceptional weather conditions, *Dothichiza populea* [ibid., xvii, p. 728] caused heavy losses to poplars, mortality reaching 95 per cent. on Canadian poplars in one locality, while in another an entire grove of two-year-old trees succumbed to infection. Pyramid and black poplars [*Populus pyramidalis* and *P. nigra*] were also affected.

Treatment of wheat seed-grain against bunt (*Tilletia tritici*) [*T. caries*] with a proprietary powder, 'germinol', showed that it was much less active fungicidally than Caffaro powder, but it markedly stimulated seed germination.

Saccharine sorghum in the provinces of Ferrara and Padua was attacked by *Sphacelotheca sorghi* [ibid., xviii, p. 517], and a *Sclerotium* causing a collar rot of the same host in Sicily was identified by Whetzel as *S. delphinii* [loc. cit.]. *Onobrychis sativa* was severely infected by *Placosphaeria onobrychidis*. Cucumbers at Brindisi and Bari were in-

fected by *Fusarium semitectum*, and artichokes (*Cynara scolymus*) near Rome by *Ramularia cynarae* [ibid., xvii, pp. 71, 217]. Beets developed a dry rot due to *S. rolfsii* [ibid., xvii, p. 643]. Tobacco at Ravenna showed infection by *Alternaria longipes* [ibid., xviii, p. 373].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 9, pp. 489–493, 5 figs., 1939.

During the last three seasons the application of very weak Bordeaux sprays has been found to give as good control of black spot of Valencia oranges [*Phoma citrocarpa*: *R.A.M.*, xviii, p. 794] in New South Wales as strong ones, without causing any appreciable damage. Consequently two alternative spray programmes are recommended: (a) Bordeaux 1½–1½–80 applied at blossoming and then 5, 10, and 15 weeks after the first spray; or (b) Bordeaux 2–2–80 applied at blossoming and then 6 and 12 weeks after the first spray.

Several cases of leaf-yellowing and stunting of lettuce plants are reported from the Sydney area. The affected plants showed chlorotic areas between the veins and along the margins of leaves and failed to form hearts of marketable size. The condition is believed to be caused by soil acidity associated with a deficiency of magnesium or calcium, or both. In field tests at the Hawkesbury Agricultural College the condition was almost completely controlled by the addition to the soil of dolomite or lime at the rate of one ton per acre prior to planting.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 10, pp. 554–558, 6 figs., 1939.

In some areas of New South Wales glasshouse tomatoes are widely affected by *Bacterium solanacearum* [*R.A.M.*, xviii, pp. 279, 422]. The disease has been present in the State, chiefly on outdoor tomatoes, potatoes, and tobacco, for 45 years. In most seasons it is not an important cause of reduced yields in tomatoes, but when an outbreak does occur it presents a somewhat difficult problem, not only because the affected plants die, but also because spread readily takes place during pruning, and the soil becomes contaminated. Loss on one property recently amounted to 20 per cent. of the crop. The disease is transmitted by chewing insects and by workers' hands. It is usually most serious on sandy soils and flourishes at high temperatures (about 95° F.) and under wet conditions. Control consists in selecting seed from healthy crops, seed treatment with mercuric chloride (¼oz. to 12½ pints water for 10 minutes), formalin disinfection of the seed-beds, steam sterilization of soil in glasshouses, crop rotation in outdoor beds (Solanaceous plants being excluded for at least three years), removal and burning of all affected plants, and washing the hands in warm, soapy water after handling diseased plants.

Peach and nectarine varieties in the coastal districts, if apt to develop freckle [*Cladosporium carpophilum*: ibid., xviii, p. 785], should be sprayed with lime-sulphur at intervals of three to four weeks, beginning in the first week of October and ending eight or nine weeks before normal harvesting for the variety concerned. Varieties ripening near the new year thus require only two spray applications, while for those ripening later a further spraying is necessary. The spray should consist of lime-

sulphur (0·125 per cent. W/V [ibid., xviii, p. 655], equivalent to 1 gal. concentrate to 160 gals. water). Colloidal sulphur 2 lb. per 80 gals. is an effective substitute. With either material a spreader should be used. After spraying for three consecutive seasons, the programme may safely be omitted for one.

Thirteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1938–1939.—134 pp., 2 graphs, 1939.

On pp. 28–31 of this report G. H. CUNNINGHAM states that *Phoma lingam* [*R.A.M.*, xix, p. 58] was isolated from moist soils in New Zealand two months after the removal of infected swedes and turnips, but was not recovered after a further period, demonstrating that the fungus does not long persist in the soil unless associated with plant tissues. Plants sprayed with Bordeaux mixture before being inoculated with the spores of the fungus remained unaffected. It would appear, therefore, that Bordeaux mixture may prove effective in protecting *Brassicae* grown for breeding and experimental purposes.

Of 11 newly introduced field pea varieties tested, one was immune from mosaic. Onion yellow dwarf [*Allium* virus 1: ibid., xviii, p. 704] was recently found in the Marshland district, its virus origin being proved experimentally. A new wilt of tomatoes, due to *Phytophthora cryptogea* [ibid., xvii, pp. 181, 585], was recorded on seedlings obtained from a Timaru glasshouse; four days after inoculation, plants wilted and collapsed near ground level. Tomato bacterial wilt (*Aplanobacter michiganense*) [ibid., xviii, p. 421] was recently observed for the first time in New Zealand. Gooseberries from Greytown were attacked by stem wilt due to *Verticillium dahliae* [ibid., vii, p. 179], a fungus hitherto recorded only on tomatoes in New Zealand.

In the section of this report dealing with fruit research and cold storage (pp. 70–75) it is stated that leaf symptoms of mottle leaf on oranges and lemons were suppressed (but only for the immediately following growth-cycle) by one spray application of manganese sulphate and hydrated lime [ibid., xviii, p. 103].

Gloeosporium perennans, hitherto recorded only on apple branches in New Zealand [cf. ibid., xvi, p. 688], was isolated from pear blossom buds at Auckland.

In a small-scale test the use of 'copperized' paper wraps (standard, commercially prepared samples) reduced contact-spread of grey mould (*Botrytis* sp.) in Winter Cole pears during seven months storage to a low figure, though control fruits in untreated paper became completely infected.

Jonathan apples from trees to which applications of potash had been made [cf. ibid., xviii, p. 235] were again more resistant to breakdown, fungal infection, and superficial scald during prolonged storage than apples of the same variety from untreated trees.

SETH (L. N.). **Report of the Mycologist, Burma, Mandalay, for the year ended 31st March, 1939.**—6 pp., 1939.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 155]. During 1938, infection of rice by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on Kanhalu farm, Mandalay,

was very slight, whereas in cultivators' fields in the vicinity, infection was very severe, possibly owing to the inadequate water supply.

Sorghum seed soaked in water for four hours during one morning in summer and then dried in the sun for six and four hours showed, respectively, 4·4 and 6·6 per cent. infection by *Sphacelotheca sorghi* [cf. ibid., xiv, pp. 22, 156], as compared with 8·5 per cent. infection in the untreated control. Better results would probably be obtained in April or May when the temperatures in the sun are higher.

All wheat-growing areas reported heavy losses from *Puccinia graminis*, while *P. glumarum*, widely present the year before, was not found.

Betel vine (*Piper betle*) mildew, caused by a species of *Oidium* [ibid., xviii, pp. 156, 437], was moderately serious in most localities; in one experiment, spraying the plants with a 0·5 suspension of 'ialine' colloidal sulphur reduced infection from 17·96 to 10·35 per cent. after one month, whereas in the unsprayed control plot infection rose from 17·27 to 44·78 per cent. Betel vines treated against foot rot (*Phytophthora colocasiae*) [ibid., xvii, p. 587] by an application of 1 per cent. Bordeaux mixture made at the time of pulling down for renovation and once a month afterwards for four months showed 2·8 per cent. infection, as against 22·8 per cent. in the controls.

The edible straw mushroom (*Volvaria diplasia*) continued to be popular among growers, 634 bottles of spawn being issued, as against 514 the year before. Improved yields were given when the beds were watered with 2 gals. water morning and evening in dry periods. In five experiments yields were increased, as compared with untreated beds, by the addition to the beds of ground seed of pigeon pea or chick pea, production also being much earlier in the treated than in the untreated beds. The *Corticium* disease [ibid., xviii, p. 156] again appeared, but was controlled by spraying with 4 per cent. formalin solution. On the Kanhalu farm this disease completely inhibited mushroom production. *Cystopus candidus* [ibid., xviii, p. 655] is recorded for the first time for Burma on *Brassica campestris* [an oilseed crop] from two localities.

NATTRASS (R. M.). **Annual Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Kenya, 1938*, ii, pp. 42–47, 1939.

Of 18 samples of wheat stem rust [*Puccinia graminis*] tested in Kenya during 1938 by F. W. Evans, 14 were form K5 [*R.A.M.*, xviii, p. 439], one sample was a mixture of K3 and K5 in which the former predominated, and the remaining three were form K2. Forms K1 and K4 were not recorded during the year. A sample received from Uganda belonged to form K2. Of three samples collected in Tanganyika in June, K4 was present on two and K3 on the third, while of three others found in August, also in Tanganyika, one was a mixture of K3 and K4, the second was K4, and the third K5.

Fungi found on passion fruit for the first time in Kenya included *Alternaria passiflorae* [ibid., xviii, p. 235], causing leaf spot but shown experimentally to be able to infect the fruit, and *Septoria fructigena*, isolated from the fruit, and shown by artificial inoculations readily to cause lesions on leaves and fruit. Golf greens of *Cynodon dactylon* were affected by brown patch due to *Helminthosporium cynodontis*. *Sclerotinia minor* [ibid., xvii, p. 128] was isolated from pyrethrum [*Chrysan-*

themum cinerariaefolium), a root rot and wilting of which were probably due to this fungus. A severe leaf-splitting of *Phoenix reclinata* was caused by *Exosporium palmivorum* [ibid., ix, p. 64].

Rapport annuel pour l'exercice 1938 (I^re^ partie). [Annual report for the year 1938 (1st part).]—*Publ. Inst. nat. Étud. agron. Congo Belge*, 269 pp., 35 figs., 2 graphs, 1 map, 1939.

This report contains, *inter alia*, the following items of phytopathological interest. Sweet potatoes are somewhat severely infected by *Alternaria solani* in the part of the Belgian Congo bordering on Uganda, but the damage caused is much less than in the vicinity of Rutshuru. The fungus causes serious defoliation of potatoes also.

Citrus at N'Dele is attacked by a bacterial leaf disease due either to *Bacterium* [*Pseudomonas*] *citri* or another organism inducing the same symptoms. The leaves and inflorescences of mangoes are attacked by *Bact. mangiferae*. Infection of coffee roots by a species of *Rigidoporus* and *Pseudococcus citri* is favoured by faulty cultural methods. Old *Hevea* rubber stumps are important sources of infection by the fungus. The spraying of coffee with a suspension of the spores and mycelium of *Beauveria bassiana* [*R.A.M.*, xviii, p. 735] gave positive results against *Stephanoderes* [? *hampei*].

Sclerospora sorghi was noted on *Sorghum arundinaceum* and *Sorosporium reilianum* on sorghum. Oil palms were infected by *Delortia palmicola*, a species of *Ascochyta* (on the leaves of seedlings in a nursery), and *Ganoderma applanatum*. *Cinchona ledgeriana* at Nioka showed the presence of *G. pseudoferreum* and *Corticium salmonicolor* [ibid., xviii, p. 729].

The organism causing cotton wilt at Bambesa was identified at Baarn as *Fusarium vasinfectum* f. 1 [ibid., xviii, p. 797]. Other fungi attacking cotton were *Alternaria macrospora* and *Rhizoctonia* [*Corticium*] *solani*. At Gandajika infection of cotton by *Nematospora* [*coryli* and *N. gossypii*: loc. cit.] averaged 22 per cent. Evidence was obtained that the disease (stigmatomycosis) can be transmitted by *Antestia cincticollis*.

Belgrave (W. N. C.). **The Division of Plant Pathology.**—*Rep. Dep. Agric. Malaya, 1938*, pp. 69–73, 1939.

Most of the information given in this report has already been noticed from another source [*R.A.M.*, xviii, p. 503]. The smooth Cayenne or Sarawak pineapple is stated to be very susceptible to fruitlet brown rot [ibid., xvii, p. 192], the yellow bacillus associated with the disease [resembling *Erwinia ananas*] being most commonly isolated from diseased fruits of this variety. Observations on fruits from two adjacent plots showed that whereas 12 per cent. of the fruits of the Singapore canning variety were only lightly affected, 80 per cent. of the Sarawak fruits were so heavily diseased as to make most of them unfit for canning or consumption. The yellow bacillus grows scantily on cultural media below P_H 4·0, and it is of interest to note that the juice of the Singapore fruits was considerably more acid (P_H 3·85) than that of the Sarawak (4·5).

Young areca palms in the Province Wellesley were attacked by a hitherto unobserved form of stem rot causing on the young, green

stems brownish lesions which were black beneath. The diseased tissue yielded predominantly *Nigrospora sphaerica*.

REICHERT (I.). **Palestine : diseases of field crops.**—*Int. Bull. Pl. Prot.*, xiii, 9, pp. 204–210, 1939.

A preliminary list is given of diseases observed on field crops (mainly grasses and cereals) in Palestine from 1923 to 1938, and studied at the Agricultural Research Station, Rehovoth.

ISRAILSKI (V. P.) & CHISTOSERDOVA (Mme G. V.). Серологические исследования растений, пораженных бактериальными болезнями. [Serological examination of plants affected with bacterial diseases.].—*Микробиол.* [*Microbiol.*], viii, 1, pp. 101–115, 1939. [English summary.]

In further studies in Moscow on the possibility of applying serological tests for the diagnosis of bacterial diseases [*R.A.M.*, xviii, p. 445], extracts from the rind of lemon fruits and branches of lemon trees infected with *Bacterium* [*Pseudomonas*] *citriputeale* gave a precipitate with rabbit sera immunized against this organism, whereas extracts from healthy plant material gave none; none of the extracts gave any precipitate with normal rabbit sera. Similar results were obtained in analogous tests with *Bact. mori*. A few normal sera gave precipitates with extracts from healthy plants, e.g. cotton, possibly owing to the presence of some pseudo-antibodies, and it is, therefore, of importance only to prepare immune sera from rabbits whose normal sera do not react in this way. Extracts from branches of lemon trees naturally infected with *P. citriputeale* failed to precipitate, however, with sera immunized against strain 'lemon 25' of this organism, and a biochemical and serological examination of three out of the 15 strains isolated from these branches showed them to differ from strain 'lemon 25' in various respects. Similar tests with beans and *Bact. xanthochlorum* (strains 69 and 77) also demonstrated that the precipitation reaction is specific, and takes place only when the sera used are immunized against a strain of bacterium serologically identical with, or closely related to, that present in the infected plant. Extracts from tomato and sunflower galls caused by *Bact. tumefaciens* gave very small precipitates with sera immunized against the same strain of the organism, and this is held to substantiate the observations of earlier workers that the galls contain only very small numbers of bacteria.

RIKER (A. J.) & BALDWIN (I. L.). **The efficiency of the poured plate technique as applied to studying bacterial plant pathogens.**—*Phytopathology*, xxix, 10, pp. 852–863, 1939.

The ordinary poured-plate technique is considered to be open to various objections from the standpoint of critical bacteriological studies, among its defects being the development of many of the colonies from bacterial clumps rather than single cells, the confluence of a large number of colonies in the commonly employed dilutions, and the occasional failure of dilution plates to separate important plant pathogens. One of the best modifications of the standard method consists in allowing the culture destined for purification to reach the 'logarithmic growth

phase', which in the case of many plant pathogens occurs in 12 to 24 hours at 24° C.; pellicle and sediment commonly appear after 36 to 48. Successive dilutions are then made in several lots of a suitable liquid medium and mixed with melted and cooled agar in Petri dishes. Colonies are selected for transfer from plates with a small number only and examined under magnification for any evidence of contamination. The probability of coalescence, which is greater the larger the number of colonies per plate, and the more considerable their dimensions, has been estimated by a statistical method. This line of approach may also be usefully applied to bacterial plate counts and to the local lesion method for the study of plant viruses. Though single-cell isolations give greater assurance of purity of cultures than even well-adjusted dilution plates, both methods have certain advantages and may be regarded as complementary.

SPRAGUE (R.). **Soil-borne cereal diseases in coastal Oregon.**—*Northw. Sci., Wash.*, xii, 4, pp. 74–80, 1938. [Received November, 1939.]

Hay oats, the chief cereal crop in the coastal area of Oregon, are liable to attack by a number of fungi thriving in the acid (P_H 4·8 to 5·3) soils of the region. The most serious disease observed since 1930 is a foot rot caused by *Fusarium culmorum*, which is also found on wheat, spelt, and barley, but more or less severe damage is inflicted by the red leather leaf disease (*Pseudodiscosia avenae*) [*R.A.M.*, xv, p. 572], *Helminthosporium avenae* [ibid., xvii, p. 809, *et passim*] (especially on the Red Algerian, Kansta, and Red Rustproof semi-winter-hardy varieties), *H. sativum*, *Rhizoctonia* sp., *Septoria tritici* [ibid., xviii, p. 297], and *Ophiobolus graminis*. Other hosts of *H. sativum*, *R.* sp., and *O. graminis* in the coastal region are wheat, spelt, and barley. In inoculation experiments *R.* sp. also gave positive results on *Lolium perenne*, *L. multiflorum*, *Holcus lanatus*, *Bromus rigidus*, *Festuca myuros*, and vernal emmer.

Generally speaking, winter cereals are not adapted to the lighter coastal soils, though Oregon Gray (Winter Turf) and Support oats may be grown in certain districts. Fulhio wheat will yield an adequate grain crop, but most other wheat and all barleys are mainly unproductive. The Alstroum and Bearded and Red Winter spelts are well adapted to local conditions. Spring-sown oats vary in their reaction to *Fusarium* root rots; Anthony, Eclipse, Green Mountain, Hawkeye, Minrus, and Rusota were comparatively resistant in these observations, which require amplification, however, for the determination of the best varieties for cultivation. Schoolmam, an oat variety grown primarily for grain, is somewhat susceptible to foot rots though resistant to crown rust [*Puccinia coronata*], and should be replaced if varieties resistant to both diseases are developed.

MATHENY (G. E.). **A summary of the cereal rust situation in Virginia in 1938 with notes on other cereal diseases.**—*Plant Dis. Reptr Suppl.* 115, pp. 41–49, 1 map, 1939. [Mimeographed.]

A cereal rust survey carried out in Virginia in 1938 showed that both stem rust (*Puccinia graminis*) of wheat, barley, oats, and rye, and leaf rusts (*P. triticina*, *P. dispersa*, and *P. anomala*) of wheat, rye, and barley,

respectively, appeared exceptionally early, evidently largely owing to unusually favourable moisture and temperature conditions for growth during the early part of the season, which was about two weeks advanced in April. A direct correlation was found to exist between temperature and moisture conditions in April, May, and June, and the dates of appearance of various stages of the rusts on their host plants in the years from 1934 to 1938, inclusive. A considerable reduction in the amount of stem rust infection in wheat was observed in fields where barberries had been eradicated.

WINKELMANN (A.) & RANCK (G.). **Untersuchungen über die Lagerfähigkeit von kurznassgebeiztem Getreide.** [Investigations on the suitability for storage of seed-grain disinfected by the short liquid method.]—*Tech. in. d. Landw.*, xx, 9, pp. 191–193, 1939.

A tabulated account is given of the writers' laboratory experiments at a Westphalian agricultural seed-producing establishment on the effects of the so-called 'short disinfection process' [*R.A.M.*, xvii, pp. 100, 509, *et passim*] on the seed-grain of three barley varieties, three samples of Petkus rye and two each of Carsten's V, Strube's Square-head, and Heine's III wheat, with special reference to any modifications calculated to impair its suitability for storage. Two preparations, designated A and B, were used at normal (3 l. per 100 kg.) and excess (4 l.) concentrations. The treated material was germinated in sand at a temperature of 15° C., falling to 10°. The outcome of the tests showed that the seed-grain treated at the normal strength could be stored for periods of up to six weeks without risk of deterioration. Susceptibility to excess concentrations varied in the different varieties and samples.

LEUKEL (R. W.) & NELSON (O. A.). **Chlorine gas as a seed disinfectant.**—*Phytopathology*, xxix, 10, pp. 913–914, 1939.

A preliminary account is given of laboratory experiments on the use of chlorine as a seed disinfectant. Exposure for two hours to a concentration of only 1 per cent. chlorine gas by volume completely inhibited the germination of barley covered smut [*Ustilago hordei*] and sorghum covered kernel smut [*Sphacelotheca sorghi*] under certain [unspecified] conditions. Wheat bunt [*Tilletia caries* and *T. foetens*] was effectively combated by two hours' exposure of the seed-grain to 3 to 9 per cent. chlorine gas, while *S. sorghi* succumbed to 10 per cent. after one hour. The smuts of oats [*U. avenae* and *U. kolleri*] and barley [*U. nuda*], however, were not appreciably weakened by the subjection of the seed-grain to a 10 per cent. strength for two hours. In general, the results of the tests showed that to ensure the elimination of superficial seed-borne spores without injury to the seed-grain, the time of exposure should range from one to two hours, the gas concentration from 3 to 9 per cent., and the volume of pure gas from 20 to 40 per cent. of the net volume of the seed-grain.

SMITH (R. W.). **Grasshopper injury in relation to stem rust in spring Wheat varieties.**—*J. Amer. Soc. Agron.*, xxxi, 9, pp. 818–820, 1939.

With some exceptions, wheat varieties severely damaged by stem rust [*Puccinia graminis*] in a very destructive epidemic in North Dakota in

1938, sustained considerably more injury from grasshopper (*Melanoplus mexicanus*) attacks than those only slightly affected [*R.A.M.*, xix, p. 9]. The incidence of grasshopper infestation on five varieties showing 75 per cent. rust (Reward, Reliance, Red Fife, Marquis, and Supreme) ranged from 60 to 95 per cent., but was only 20 per cent. on Hope and Pilot (2 per cent. rust).

Newton (Margaret) & Johnson (T.). **A mutation for pathogenicity in Puccinia graminis tritici.**—*Canad. J. Res.*, Sect. C., xvii, 9, pp. 297–299, 1939.

In the course of a study on *Puccinia graminis tritici* in Canada, a pathogenic change was observed in a uredo culture of race 52 of the fungus, which had previously remained constant in pathogenicity for nearly two years in storage, the possibility of contamination being excluded. This change, which can only be explained on the assumption of mutation, first became manifest following a six months' storage of the original culture on wheat in the refrigerator at a temperature of about 8° C., when race 52 appeared to be largely replaced by another race. Stored for a further period of four months the original culture gave rise to a pure culture of the new race with no traces of race 52 left. The new race proved to be one hitherto undescribed, and has been given the number 178.

Lathbury (R. J.). **Annual Report of the Plant Breeder.**—*Rep. Dep. Agric. Kenya, 1938*, ii, pp. 52–59, 1939.

During 1938, form K5 of wheat stem rust [*Puccinia graminis*: see above, p. 71] was present throughout Kenya, even at an altitude of 9,000 ft., but on the whole did not cause serious damage, though certain localities at the lower elevations suffered severely. The new wheat, No. 58, was again badly affected [*R.A.M.*, xviii, p. 439].

Kenya Governor, Equator, and Golden Ball wheats were found to be less susceptible to form K5 than were most of the varieties grown in Kenya, while Sabanero was generally resistant. Variety No. 117A (Njoro Hybrid × Marquis) has so far shown complete resistance to form K5, and is, in fact, resistant to all forms, though least so to K3. Two strains of Double Cross × Ceres 721 selected in 1937 were completely resistant to K5. Reliance wheat, susceptible to K3, was resistant to K5, and should be useful as long as K3 does not appear in an epidemic form. Australian 26 A (Kenya Standard × Baringa × Nabawa × Wandilla) has shown resistance to K5 in the field.

In some districts, early sown wheat, owing to wet conditions at flowering and when the grain was filling, was again affected by black chaff [*Bacterium translucens* var. *undulosum*: ibid., xviii, p. 665] and glume blotch [*Septoria nodorum*: ibid., xvi, p. 733]. Take-all [*Ophiobolus graminis*: ibid., xv, p. 483] was still present in some wheat fields, but on the whole caused no serious trouble.

Straib (W.). **Die Faktorenbeziehungen im Verhalten des Weizens gegen verschiedene Gelbrostrassen.** [Factorial relations in the reaction of Wheat to different races of yellow rust.]—*Z. indukt. Abstamm. u. VererbLehre*, lxxvii, 1, pp. 18–62, 2 figs., 1939.

A detailed, fully tabulated account is given of the writer's experi-

mental studies at the Gliesmarode (Brunswick) branch of the Biological Institute on the co-operation of the genes determining the reaction of wheat to different physiologic races of yellow rust (*Puccinia glumarum*) [*R.A.M.*, xviii, p. 734]. For this purpose a white spelt possessing high and constant resistance to all the races so far differentiated was crossed with the Strube's and Carsten's V Squareheads, Spalding's Prolific, Heine's Club, and Peragis, which in turn were crossed among themselves; crosses were further made between other varieties. The progeny of eleven crosses was studied in the greenhouse and that of five in the field.

The resistance of the white spelt proved to be of a monomerous-dominant order in relation to the susceptibility of the various commercial varieties, and monomerous-recessive in respect of absolute freedom from infection shown by certain commercial sorts. The latter character and susceptibility of the *vulgare* parents were found to be conditioned by the same pair of allelomorphs, while the resistance of the white spelt to the various races tested (1, 2, 5, 7, 9, 15, 20, 26, 35, and 37 in the greenhouse; 2, 7, and 9 in the field) was also transmitted to its offspring by means of one and the same genetic factor. The different crosses within the *vulgare* wheats obeyed similar laws, freedom from infection being invariably monomerous-dominant, while this character and resistance to certain races were governed to some extent by the same factors.

Some evidence was forthcoming that reaction to yellow rust in some of the crosses is dependent on the operation of allelomorphs belonging to a multiple series, while the complex relationships in certain hybrid progenies point to plurifactorial inheritance. Summer susceptibility predominated over summer resistance in the material under observation. In two instances the segregation ratios in the F_2 indicate a monohybrid inheritance of summer resistance, while in other crosses the F_3 and F_4 segregation procedure was suggestive of a polymerous origin for this character. The factors conferring summer resistance to a given physiologic race appear to be similarly active in respect of others, just as the factors for absolute resistance in the seedling stage are probably correlated with those for relative and summer resistance. On the other hand, no connexion could be traced between the genes for yellow rust resistance and the ear characters of spelt.

Becker (Hanna) & Hart (Helen). **Das Auftreten und die Verbreitung von Gelbrost in Ostharz und den daran angrenzenden Weizenanbaugebieten.** [The occurrence and distribution of yellow rust in the eastern Harz and adjoining Wheat-growing districts.]—*Z. PflKrankh.*, xlix, 7–9, pp. 449–481, 4 maps, 1939.

A comprehensive, tabulated account is given of the writers' studies in 1937–8 on the occurrence and distribution of yellow rust of wheat (*Puccinia glumarum*) in the eastern Harz mountains, Germany [*R.A.M.*, xviii, p. 512], a wheat-growing region where a number of different climatic conditions prevail in a comparatively restricted area. A heavy rainfall (mean of 600 to 800 mm. per annum) and low average temperature (7° C.) were found to be prerequisite conditions for the development of rust, but even where these are fulfilled the disease can only thrive on impermeable soils affording a plentiful water supply for

vigorous plant growth. On the other hand, the adverse influence of dry, warm climates may be counteracted by the localized moisture of a river valley or other low-lying site, permitting the development of a restricted epidemic. Another factor impeding the full scope of yellow rust is the cultivation of locally resistant varieties, though where such resistance is only partial young plants may contribute to the spread of infection by acting as a source of spring inoculum for neighbouring stands of susceptible varieties. All things considered, it may be concluded that a really destructive outbreak of *P. glumarum* is only possible when the partnership between host and pathogen admits of the free growth of the latter unhampered by environmental factors [ibid., xvi, p. 371]. No variety is completely resistant to all races under all conditions, and the exclusive cultivation of a given resistant variety may facilitate the multiplication of a specific physiologic race, thus entailing a certain risk, but at the same time the existence of such varieties is a valuable safeguard against the indiscriminate spread of the rust.

Since *Agropyron caninum* proved to be susceptible in greenhouse inoculations to various physiologic races of yellow rust from wheat, barley, and grass, and was further found infected by race 6 from wheat in the open, it is considered very probable that the grass serves as a source of supply of uredospores during the unfavourable months of July and August, and later for the winter crops sown in October to November. In this connexion it should be remembered that the grass (*Triticum* [*A.*] *repens* and *A. caninum*) rusts can also attack barley, being particularly severe on the Granat variety, which suffers heavy damage from *P. glumarum* in the foothills of the Harz mountains.

PRIDHAM (J. T.). **A successful cross between Triticum vulgare and Triticum timopheevi.**—*J. Aust. Inst. agric. Sci.*, v, 3, pp. 160–161, 1 fig., 1939.

The author reports successful crossing in New South Wales between *Triticum timopheevi* [*R.A.M.*, xv, p. 352], reputedly resistant to *Puccinia graminis* and *P. triticina*, and Steinwedel wheat, several promising fifth-generation lines from this cross being fixed for apparent immunity.

MONTEMARTINI (L.). **Dieci anni di osservazioni sopra la ruggine del Grano nella Sicilia occidentale.** [Ten years' observations on Wheat rust in western Sicily.]—*Riv. Pat. veg.*, xxix, 7–8, pp. 337–357, 1939.

During ten years' observations on outbreaks of wheat leaf rust (*Puccinia triticina*) [*R.A.M.*, xiii, p. 18] in western Sicily uredosori were found present in November, 1933, on a few badly growing plants that had been sown under irrigated conditions in July of that year; in January and February, 1934, the new leaves on the same plants were severely infected. The same phenomenon occurred in 1935–6. Epidemics were observed in February, 1936; in March or April in 1930, 1931, 1933, and 1934; in May in 1932 and 1939; and in June, 1938: apparently for epidemics to occur the plants must have reached a stage of growth in which they are relatively susceptible.

The high temperature of 42°C. reached in July, 1931, may have exerted

a deleterious effect on the germination of the uredospores and the wild hosts of the fungus and have occasioned the considerable delay in the development of the epidemic in 1932. Similarly no epidemic occurred in 1935, which year had again been preceded by a very hot summer in 1934. In 1932, wheat, which was in an excellent condition on 13th May save for a few leaves showing uredosori, developed an intense epidemic by the 30th following a few hot humid days. The incubation period under these conditions lasted eight days. In the case of very late infections on wheat nearer ripening the incubation period was longer, extending to about four weeks (for the formation of uredospores) in June, 1938.

Under Sicilian conditions no aecidia of *P. triticina* have ever been observed, even in two years when species of the alternate host, *Thalictrum*, were grown experimentally beside and among severely affected wheat plants. It would therefore appear that locally *P. triticina* only very exceptionally passes to an alternate host. The teleutospores of *P. triticina* never develop normally under Sicilian conditions, as the infected plants dry up too soon; when they do occur, on the straw, they seldom germinate. Uredospores that develop on wheat in May and June apparently survive the summer on this host and germinate in the autumn [ibid., xviii, p. 167].

The effect of sowing date on susceptibility varies to some extent with the prevailing weather and the locality concerned. In the spring of 1939, Sammartinara wheat sown in November at Palermo was much more severely attacked than when sown in January.

Ten years' results have shown that the most susceptible varieties locally are Majorca, Mentana, and Sammartinara, followed in order of decreasing susceptibility by Ardito, Dauno III, Realforte, Biancolilla, Bidi, Sen, Cappelli, Russello, Aziziah, Regina, Russia, Timilia, Roma, Villa Gloria, and Vincetutti. The last three varieties have been tested for resistance only once.

Bever (W. M.). **Reinoculation of resistant varieties of Wheat with purified physiologic races of Tilletia tritici and T. levis.**—*Phytopathology*, xxix, 10, pp. 863–871, 1939.

A tabulated account is given of the writer's trials from 1935 to 1937 at the Idaho Agricultural Experiment Station to determine the effect on the wheat varieties, Hybrid 128, Oro, Ridit, Martin, Albit, White Odessa, Hussar, and Turkey, all resistant to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], of repeated reinoculation with six 'purified' physiologic races (collected from the varieties themselves), viz., T–6, T–8, T–9, T–10, L–6, L–8, and a species hybrid [*R.A.M.*, xvii, pp. 505, 665, *et passim*]. With the exception of the last-named, none of the 'purified' races caused any significant increase of infection over the three-year period. The species hybrid induced a rising incidence of infection on Turkey—from 9 per cent. in 1935 to 11 in 1936 and 35 in 1937—indicating that the component of the inoculum to which the variety is resistant was being strained out, leaving a concentration of the more virulent portion. The discrepancy between the author's results and those of Bressman [ibid., xi, p. 33], Melchers [ibid., xiv, p. 227], and Dillon Weston [ibid., viii, p. 436] is attributed to the

use in the present experiments of 'purified' races of the bunt fungi on the lines indicated by Flor [ibid., xiii, p. 86].

WALSTEDT (I.). **Några erfarenheter rörande stinksotets fördelning på fältet.** [Some observations on the field distribution of bunt.]—*Landtmannen, Uppsala*, xxiii, 35, p. 855, 1 fig., 1939.

Observations in 1938 at Linköping, Sweden, on a 3-hect. autumn wheat field revealed striking disparities in the incidence of bunt [*Tilletia caries* and *T. foetens*] in the six strips of rows, 100 by 1 m., traversed at right angles for the purpose of counting, the numbers of diseased plants per 10 sq. m. being 0·4, 0·5, 3, 6, 15, and 45 in strips 1, 2, 3, 4, 5, and 6, respectively. The seed-grain having all been treated before sowing, the uneven distribution of infection in the field is attributed to differences in the constitution of the soil, the clay-mould on a calcareous substratum of the upper part being evidently more favourable to the fungus than the deep clay of the lower portion. In 1939 the incidence of bunt in a crop from treated seed-grain rose from two to five plants per 10 sq. m. with a week's delay in sowing.

SPRAGUE (R.). **Controlling seed-borne stinking smut of Wheat by disinfectants.**—*Bull. Ore. agric. Exp. Sta.* 363, 33 pp., 1939.

In field experiments carried out in Oregon from 1934 to 1938 complete control of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xviii, p. 301] in Hybrid 128 wheat was obtained with new improved ceresan, 52 per cent. copper carbonate, 50 per cent. basic copper sulphate, and 26 per cent. copper fungicide, the first-named being used at the rate of $\frac{1}{2}$ to $\frac{3}{4}$ oz. per bush. and the others at that of 3 oz. per bush. for winter and 2 oz. for spring wheat. Bunt development becomes more serious when wheat is sown late in September in increasingly cold and moist soil and control measures were found to decrease in effectiveness with successively later dates of sowing [ibid., xiv, p. 681 *et passim*]. Under late sowing conditions copper carbonates containing 18 to 20 per cent. copper were ineffective, that containing 52 per cent. giving better but still unsatisfactory results, while new improved ceresan at increased rates of $\frac{3}{4}$ to 1 oz. per bush. and basic copper sulphate were fairly effective. The importance of soil-borne bunt is stated to have diminished since the introduction of the combine harvester, for when the threshing was done with the stationary machines late in the season the clouds of bunt spores settled over the summer fallow, whereas with combine harvesting the bunt shower is distributed earlier and is smaller in quantity. Where soil-borne infection occurs in a severe form it is practically beyond control, but light soil infestation is held down though not eliminated by copper dusts at 3 or preferably 4 oz. per bush., or new improved ceresan (1 oz.) applied just before sowing.

The length of time between treating with a copper dust and sowing had no effect either on the germination of the seed-grain or the effectiveness of the fungicide, but seed-grain treated with new improved ceresan at $\frac{1}{2}$ to $\frac{3}{4}$ oz. per bush. showed increased stands over untreated if sown a few days after treatment. After six weeks in storage seed-grain so treated slowly decreased in viability, so that after one year it had to be sown about 10 per cent. more thickly than normal. Grain treated at

the rate of 1 oz. per bush. should be sown within a week to produce improved stands, though the decrease in viability after several weeks is only slight, whereas after 14 months in storage the loss in stand is about 10 to 15 per cent.

There was little difference in facility of control on any of the better soils for growing wheat in the State, all being capable of permitting heavy infection, but on acid soils control was easier, while on heavy ground all treatments that weaken germination should be avoided. The addition of unbroken bunt balls to healthy grain in proportions varying from 3 to 30 per cent. materially reduced the effectiveness of the fungicides. New improved ceresan at ½ oz. per bush. was ineffective, but good control was obtained with the 1 oz. rate (0·5, 7·9, 1·6, and 0·2 per cent. bunted ears occurring in treated seed with 30, 5, 18, and 5 per cent. bunt balls, respectively). Good control was also obtained with formalin (1 in 320, soaking for 5 to 10 minutes), and complete elimination with copper sulphate solution in 2·5 per cent. O.S. Vatsol, a wetter, although the wet treatments were injurious to germination. Control with copper dusts was somewhat uncertain. Under farm conditions, since very little seed-grain contains more than a trace of bunt balls, treatment with new improved ceresan at ½ to ¾ oz. is usually sufficient, but moderate or excess quantities of balls would require the ¾ to 1 oz. rates. In a footnote it is stated that bunt balls may be killed at the ½ oz. rate if the grain is covered for three days after treating.

In comparative tests of copper dusts, the differences between the effectiveness of various brands of copper carbonate and basic copper sulphates with 50 to 54 per cent. copper were no greater than those observed between different lots of the same brand. Copper dusts containing about 26 per cent. copper were effective against medium and light infections of bunt, but the copper carbonate dusts containing 18 per cent. copper were distinctly less effective under adverse conditions. A number of other copper dusts were not sufficiently effective or too costly. Monohydrated copper sulphate and anhydrous cupric chloride were effective but irritating to the nose, and hygroscopic. Arsenic compounds gave good control but are too dangerous to use.

For the control of bunt in spring wheat, which is more amenable to treatment than that in autumn-sown stands, new improved ceresan at ½ oz. per bush. or copper dusts at 2 oz. are recommended. It appears desirable to treat Ridit and other wheat varieties resistant to seed-borne races of bunt to reduce the losses from the disease and from winter injury attributed to latent bunt infection. The summarized data on seed-grain treatment with the recommended disinfectants showed increased stands in from 44 to 90 per cent. of the cases.

Jones (G. H.). **Systematic and automatic warm water steeping to control loose smut of Wheat.**—*Bull. Minist. Agric. Egypt* 220, 12 pp., 10 pl., 1939.

In experiments on warm water steeping for the control of loose smut of wheat [*Ustilago tritici*: *R.A.M.*, xvi, p. 245] seed-grain, in lots of 5 kg., was steeped in a large incubator for 10, 8, and 6 hours at 40° C.; 8, 6, and 4 at 43°; and 6, 4, and 2 at 46°, and after the treatment thoroughly dried in the sun for the whole day. All these treatments reduced the

percentage of loose smut from 4·11 in the untreated control to between 0·095 and 0, but the percentage of germination in completely controlled plots fell from 99 to between 49 and 57 in the laboratory and was very low in the field. The best results were obtained with soaking for six hours at 43°, the percentage of germination being then 97, that of infection 0·014, and consequently the efficiency of disease control 99·66 per cent.

At the Government farm the produce of miniature chequers of selected new wheats or the best of the established varieties is used for planting the so-called nucleolus (about 60 kg.) on about a quarter of an acre, the produce of which is in turn used next year for planting the nucleus (about 600 kg.) on about 5 acres, and the produce of that (about 6 tons) planted the following year on a large scale separately from other wheats to prevent crossing and mixing. Under this system treatment may be made most conveniently at the nucleolus stage.

An automatic machine for warm water treatment, designed in Egypt, is described. It consists of a large, circular tank insulated against heat, with an outer case fitted with four wheels running on short rails. On the bottom of the tank is placed a ring-shaped, perforated seed basket with a capacity for 75 kg. grain, into which seed is fed from a hopper above the tank. For treatment the tank is filled with about 280 l. of previously heated water (at 41·5° in the typical experiment described) and maintained at a controlled temperature. When treatment is completed (after six hours) the tank is pushed forward on the rails so that the basket with the treated seed can be hoisted out by means of a chain block and, after the tank has been pushed back again, can be lowered and emptied of seed. The apparatus can be set for the seed to fall into the perforated basket at any given time, and at completion a bell is rung automatically, warning the operator to empty the charge.

In 1935 the amount of loose smut on the nucleolus plot of 2/5 feddan of the Beladi 116 wheat (a new variety of *Triticum durum*) was counted as 219 plants, or 550 per acre. Roguing of plant rows begun in the same year, and one treatment of the seed from this plot carried out in 1936 by means of the machine described above reduced the amount of loose smut in the following year's nucleus plots of 10 feddans to 7·2 plants per acre, showing a disease control efficiency of 98·7 per cent. In the same year new seed from rogued rows was treated and sown for the nucleolus crop which was completely free from disease. It is clear from these results that roguing the plant rows combined with a single warm water steeping is sufficient to eliminate the disease entirely, the second generation remaining uninfected.

Zade (A.). **Havrens infektion genom Ustilago avenae (Persoon) Jensen.** [Infection of Oats by *Ustilago avenae* (Persoon) Jensen.]—*Nord. JordbrForskn., 1939*, 3, pp. 290–305, 1939. [German summary.]

Evidence is adduced from the author's previous investigations, and from recent experiments in Sweden, that the infection of oats by loose smut (*Ustilago avenae*) takes place through the resting mycelium, which develops within the glumes, and penetrates the seedlings in the following spring [*R.A.M.*, xii, p. 431]. A test on the Svalöv's, Guldregn, and Orion varieties showed that infection was practically negligible (maxi-

mum 0·3 per cent.) on plants of which the glumes were closed with paraffin, whereas up to 4·4 per cent. smut developed on those with open glumes, indicating that even the presence of virulent inoculum (as in this case) on the exterior of the glumes is of little importance in the etiology of the disease. The objections of McKay [ibid., xv, p. 790] and Kitunen [ibid., xvii, p. 309] to this view of the mode of infection are not accepted.

Welsh (J. N.). **Vanguard Oats—origin, description and performance.**—*Publ. Canad. Dep. Agric.* 651 (*Fmrs' Bull.* 76), 14 pp., 4 figs., 1939.

In co-operative tests carried out at various centres in western Canada from 1935 to 1938, the average percentages of stem rust [*Puccinia graminis*], crown rust [*P. coronata*], and loose and covered smuts [*Ustilago avenae* and *U. kolleri*] in strain 339 of Vanguard oats (a cross between Hajira and Banner made in 1926) were 0, 45, and 1·5, respectively, the corresponding figures for Vanguard 7 (a more prolific selection from the foregoing), Rusota, Anthony, Banner, and Gopher being 0, 45, and 1·6; 0, 45, and 2·3; 0, 45, and 10·9; 20, 70, and 3·5; and 10, 75, and 0·9, respectively. The eastern Canadian trials (1936 to 1938) yielded data indicating that Vanguard may be specially recommended for areas (such as eastern Ontario) where stem rust is prevalent, whereas Erban, a new variety produced at the Ontario Agricultural College, is preferable for districts liable to severe epidemics of crown rust.

Malan (C. E.). **La Calonectria graminicola (Berk. et Brme) Wr sulle carriosidi di Segale della zona alpina (Alpi Cozie).** [*Calonectria graminicola* (Berk. & Br.) Wr on the inflorescences of Rye from the Alpine zone (Cozie Alps).]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 323–325, 1939.

In 1938 the author observed that on an average over 30 per cent. of the culms in rye fields in the Cozie Alps bore the perithecia of *Calonectria graminicola* [*R.A.M.*, xviii, p. 516], which were also present on the lower leaf sheaths. Infection of the inflorescences, however, was found to be very slight, over 95 per cent. germination of the grain being secured; the conidial stage (*Fusarium nivale*) developed in some inflorescences in only 6 out of 14 lots, and appeared on only 4·4 per cent. of a sample taken from all lots and incubated on acidified carrot agar. In a further test, 135 inflorescences treated with uspulun 1 in 1,000 for 30 seconds showed only one infected by *F. nivale*, confirming the author's view that infection was merely superficial contamination.

Hopkins (J. C. F.). **Mycological notes. 12. The Diplodia danger.**—*Rhod. agric. J.*, xxxvi, 10, pp. 721–723, 1939.

Attention is drawn to the fact that at least 10 per cent. of the maize crop, that is, about 200,000 bags of maize, are annually lost in Rhodesia owing to attacks by the *Diplodia* disease [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, xv, p. 145], and an appeal is made to growers to protect their crops by practising seed disinfection and disposing of infected trash either by (*a*) ploughing it in deeply early in the year, (*b*) composting all the debris, or (*c*) feeding it to cattle.

Landen (E. W.). **The spectral sensitivity of spores and sporidia of Ustilago zeae to monochromatic ultraviolet light.**—*J. cell. comp. Physiol.*, xiv, 2, pp. 217–226, 4 graphs, 1939.

Ultraviolet radiation from a large crystal quartz monochromator retarded the germination and subsequent growth of maize smut (*Ustilago zeae*) spores and sporidia in experiments at Missouri University, Columbia. For 50 per cent. lethality a broad minimum value in incident energy is registered in the neighbourhood of 2,650 Å for both spores and sporidia. The maximum values were recorded at 2,400 Å, below which the incident energy to kill 50 per cent. of the spores decreased slightly, while that required to destroy comparable numbers of sporidia declined more rapidly, the ratios of the incident energies of wave-lengths 2,399 and 2,300 Å for 50 per cent. killing being 1·15 and 3·28 for spores and sporidia, respectively. A comparison of incident energies for a given lethality at wave-length 2,650 Å indicates that the sensitivity of various organisms to irradiation decreases in the following order: bacteria, yeast, sporidia of *U. zeae*, *Rhizopus* spores, *U. zeae* spores. The effective long wave-length limits for the killing of maize smut spores and sporidia falls between 3,022 and 3,130 Å, a dose of $1{\cdot}5 \times 10^6$ ergs per sq. mm. producing no lethal effect at the latter length. At any given wave-length the sporidia are more sensitive to incident radiation than the spores. Using 50 per cent. killing as a criterion, the ratio of the energies required for killing spores and sporidia varies irregularly within the limits of 3·8 at 3,022 and 34 at 2,300 Å.

Measurements of the absorption of sporidial films indicated that at wave-lengths showing low absorption a high incident dose of energy must be applied and vice versa.

Castellani (E.) & Ciccarone (A.). **Malattie crittogamiche del 'Teff'.** [Fungal diseases of 'Tef'.]—32 pp., 11 figs., 4 graphs, Florence, Regio Istituto agronomico per l'Africa italiana, 1939.

In this paper, extracted from a book edited by Ciferri and Baldrati under the title 'Il Teff (*Eragrostis tef*)', E. Castellani and A. Ciccarone describe the diseases of this cereal crop observed by them in Italian East Africa during 1937 to 1939.

In new Eritrea and Amara (especially the basin of the Tana) the most prevalent disease is rust (*Uromyces eragrostidis*), which generally attacks the plants when the tassel has emerged. The uredosori form sparse, oblong pustules 0·6 to 0·8 mm. long on the upper surface of the leaves, culms, leaf sheaths, and rachids. The globose or ellipsoidal, echinulate uredospores measure 20 to 24 by 18 to 21 μ, with an epispore 1 to 1·8 (generally 1·4) μ in diameter. The unicellular, smooth, light brown, ovate, clavulate, or almost piriform teleutospores have an epispore thickened at the apex, measure 25 to 30 by 18 to 23 μ, and are borne on a light stalk about 30 by 4·5 to 4·6 μ. No aecidia or pycnidia were observed. Infection appeared to reduce the weight of the yield of grain by 10 to 25 per cent.

Bunt (*Tilletia baldratii* Montem.) frequently attacks whole inflorescences, which become conspicuously erect, with sparse ears, and swollen, open, and prematurely dry glumes. The dark snuff-coloured, globose,

piriform, or irregularly elongated chlamydospores measure 15 to 26 μ in diameter, and are provided with an epispore surrounded by a characteristic persistent, hyaline, gelatinous covering.

In western Ethiopia *Helminthosporium miyakei* [*R.A.M.*, viii, p. 530] is commonly present as a blackish growth on the ears. The acropleurogenous, 3- to 4-septate, olivaceous, sometimes translucent, oval, later variously shaped conidia measure 28 to 90 by 9 to 19 μ.

A withering of the apical part of the lower leaves was caused by a fungus with olivaceous-brown, subspherical or ellipsoidal, ostiolate pycnidia measuring 100 to 115 by 90 to 100 μ. The straight or slightly curved, rod-shaped, hyaline conidia, pointed at one end and rounded at the other, measured 20 to 30 by 2 to 2·7 μ, and showed two or three septa at maturity. This fungus is named *Septoria eragrostidis* n.sp. In some material, perithecia were observed measuring 95 to 120 by 90 to 110 μ, with clavate, rounded, almost ellipsoidal asci measuring 36 to 44 by 18 to 24 μ, and hyaline, fusoidal spores 12 to 15 by 4·5 to 5·2 μ. This fungus, which is probably genetically related to *S. eragrostidis*, is named *Mycosphaerella eragrostidis* n.sp.

A fungus apparently agreeing with *Phoma depressitheca* Bubák was observed on withering leaves of one plant and *Aposphaeria eragrostidis* n.sp. on the ears, associated with a black spotting. In damp conditions, the culms, leaves, and inflorescences show a black discoloration due to *Alternaria* and *Cladosporium* spp. and a species of *Coniosporium*. Latin diagnoses are given of the new species.

Fawcett (H. S.) & Klotz (L. J.). **Infectious variegation of Citrus.**—*Phytopathology*, xxix, 10, pp. 911–912, 1 fig., 1939.

In October, 1937, lemon leaves of a tree at Glendora, California, were observed to show an irregular chlorotic variegation, which was transmitted in the course of a few months by budding to a sour orange stock. The foliage of the latter developed irregular chlorotic areas, 5 to 10 mm. or more in width, while small, rapidly growing leaves also exhibited the characteristic pale flecking near the veinlets associated with psorosis [*R.A.M.*, xviii, p. 735]. Some of the mature leaves developed warping and pocketing, suggestive of crinkly leaf of lemon [ibid., xiv, p. 505]. In a general way the symptoms of the disorder on orange resemble those described by Petri as infectious chlorosis [ibid., xi, p. 173]. Lemon buds from another tree at Chula Vista, California, showing less conspicuous foliar symptoms and bark psorosis on sweet orange stock, transmitted to a sour orange stock by budding a mild form of the infectious chlorosis herein described, suggesting a possible relationship between psorosis and infectious chlorosis.

Fawcett (H. S.) & Rhoads (A. S.). **Lesions on Quercus laurifolia similar to those of leprosis on Citrus in Florida.**—*Phytopathology*, xxix, 10, pp. 907–908, 1 fig., 1939.

In 1932 lesions strikingly similar to those of leprosis on citrus [*R.A.M.*, xvii, pp. 27, 595, 812] were observed on small branches and twigs of young laurel oak (*Quercus laurifolia*) trees in close proximity to affected oranges on the east and west coasts of Florida and elsewhere in the State. Whether the injuries on the two hosts are due to an identical

agent, presumably of virus origin, remains to be determined. The almost invariable occurrence of the disorder near bodies of water in Florida and its frequent location in such sites in South America suggest that the vector is one that flourishes in humid situations.

Doidge (E[thel] M.) & Turner (F. A. S.). **Psorosis or scaly bark of Citrus trees.**—*Fmg S. Afr.*, xiv, 161, pp. 363–364, 1 fig., 1939.

Evidence is presented of the transmission of citrus psorosis by budding, the sole method of any commercial importance in South Africa [*R.A.M.*, xviii, p. 438], where infection may remain latent in individual trees for 20 to 30 years or more; in any case, the symptoms do not commonly appear until the trees are 9 to 10 years old. A grower at Pomona, in the Rustenburg district took buds for a nursery from three externally sound Valencia oranges on his own farm which later developed psorosis; some nine years later nursery-grown trees transplanted to the orchard began to show signs of the disease and spread continued after a lapse of 22 years. Inspectors have observed that certain nurseries consistently produce trees affected by psorosis, whereas others remain free from the disorder. In one orchard, three trees procured from a particular nursery were diseased in 1929 and 81 in 1937; on another property belonging to the same grower, 21 out of 1,000 trees from his own nurseries have shown bark lesions. On the other hand, in two orchards containing, respectively, 1,200 and 5,300 12- to 15-year-old trees supplied by a different nursery, no infection has been found.

It is pointed out that, although the elimination of sources of infection is provided for by the Psorosis Act (No. 42) of 1927 [ibid., vii, p. 128], a number of years must elapse before the full benefits of this measure are experienced, since the majority of South African citrus plantings were established after 1920. The common practice among nurserymen of taking buds from young trees, in which, as indicated above, psorosis may be latent, is greatly to be deprecated.

Wardlaw (C. W.) & Leonard (E. R.). **Storage investigations with Trinidad Grapefruit, 1938–39.**—*Trop. Agriculture, Trin.*, xvi, 9, pp. 208–215, 5 graphs, 1939.

Further investigations into the storage of grapefruit in Trinidad [*R.A.M.*, xvi, p. 600] are reported on fruit harvested during the wet season. 'Gooseflesh' blemishing (oleocellosis) [ibid., xviii, p. 805] was found on the whole to be a minor problem in Trinidad, affecting up to 12 per cent. of the fruit in some cases. The blemishes appear within 24 hours of picking and no marked increase in the extent of original blemishes takes place later. The liability to oleocellosis varied from one estate to another, being chiefly related to time of picking (more blemishing developing in fruit picked at 7 a.m. than in that picked at 10 a.m.) and, to a lesser extent, to the length of the quailing period. On estates subject to oleocellosis picking in the rain should be avoided, and in general it should not be undertaken during the wet season before 10 a.m. Each estate should carry out a test to determine the optimum conditions for picking.

Considerable differences were found to exist in the amount of fungal wastage in fruit from different estates, and very satisfactory control was

again obtained with rapid cooling to 45° F. after minimum exposure to tropical temperatures. In untreated fruit held at tropical temperatures practically all fungal wastage was caused by *Botryodiplodia theobromae* [ibid., xviii, p. 193], whereas in fruit which had been dipped in borax and treated with ethylene, the chief cause of wastage was *Colletotrichum gloeosporioides* [loc. cit.]. It was shown that while the ethylene-treated fruit showed some decrease in wastage (*B. theobromae*) due to debutton-ing, the borax treatment considerably increased the trouble by causing premature development of latent infections of *C. gloeosporioides*. The two moulds (*Penicillium digitatum* and *P. italicum*) for the control of which borax is especially intended are stated to be of minor importance in Trinidad, and the discontinuance of the treatment is therefore recommended.

For fruit picked during the wet season it was found that the chilling temperature lies close to 45°, the temperature at present used for storage. If, in order to achieve a more rapid cooling, air is delivered into storage rooms at 40°, this ought not to be continued beyond 12 to 15 hours and the temperature then raised to 45°.

[This paper is reprinted as *Mem. Low Temp. Res. Sta., Trin.*, 12, 20 pp., 4 graphs, 1939.]

FARKAS (A.). **Control of wastage of Citrus fruit by impregnated wrappers on a commercial scale.**—*Hadar*, xii, 8–10, pp. 227–230, 1939.

Further particulars are given of the author's successful experiments in 1938–9 on the control of storage rots of Palestine oranges [chiefly *Penicillium digitatum*, *P. italicum*, and *Diplodia natalensis*: *R.A.M.*, xviii, p. 102] by the use of diphenyl-impregnated wrappers. In two consignments of second-grade oranges dispatched to England in December, 1938 (20 boxes) and February, 1939 (38), the average amounts of wastage in the lots wrapped in impregnated paper were 1·5 and 0·37 per cent., respectively, compared with 9 and 9·57 per cent. in those wrapped in ordinary paper.

The largest consignment, shipped in April, 1939, containing 3,770 oranges in impregnated wrappers from 37 groves, also arrived in a satisfactory condition, with roughly 3 per cent. wastage as compared with 10 per cent. or more in most other lots received at the same time. In a storage experiment with oranges packed in January and February (180 in each month), the amounts of wastage after 4½ months in the former lot were less than 2 per cent. and semi-total in impregnated and ordinary wrappers, respectively, and in the latter after 3½ months again under 2 per cent. in the diphenyl-treated, while the ordinary wrapped fruit was completely rotted after three months. In a test made with lemons at a time when these fruits are apt to 'rot in the hand', the average percentages of wastage after 17 days in two lots of 1,200 each, one treated and the other wrapped in the ordinary way, were 11·2 and 46·3 per cent., respectively.

No ill effects followed the oral administration to a rat 160 gm. in weight and a monkey (2·5 kg.) of diphenyl over periods of 20 and 17 weeks, respectively, the weekly amounts consumed being 16 and 90 mg., respectively, corresponding to weekly doses of 7 and 2·5 gm. for a man

weighing 70 kg. A research student who consumed 435 mg. of the chemical in 13 weeks was also unaffected.

The cost of production of the impregnated wrappers on the largest of the three machines tested is calculated at $\frac{3}{4}d.$ per box, corresponding to 2*s.* per ton of fruit. It is thought that by the use of treated wrappers a further minimum saving of £25,000 per annum will be effected over the £100,000 estimated in 1937–8, when the cost of producing the wrappers was reckoned at over double the figure now found to be practicable.

Shiff (M.). **The influence of orchard conditions on the incidence of wastage in Palestinian Oranges.**—*Hadar*, xii, 8–10, pp. 233–236, 1939.

The results of a series of experiments carried out over a four-year period at the Jaffa Horticultural Station demonstrated the importance of the time of picking in relation to wastage in stored oranges due to *Penicillium digitatum*, *P. italicum*, *Diplodia* [*natalensis*: see preceding abstract], and 'nooksan' [*R.A.M.*, xviii, p. 102]. In the case of the fungal rots, oranges picked in March are more extensively damaged than those gathered in January, whereas the incidence of 'nooksan' tends to decline in the later pickings. To cite some figures, the two-year percentual averages of (*a*) *P. digitatum* and *P. italicum* and (*b*) *D. natalensis* in young trees (8 years old) were 0 and 0, respectively, and in old trees (25) 0·9 and 0, respectively, for the January pickings, the corresponding March figures being 1·7 and 0·3 and 0 and 0·7, respectively; the average 'nooksan' incidence in young and old January pickings was 9·7 and 5·6 per cent., respectively, the March figures being 3·5 and 4·1, respectively.

Oranges from trees budded on sour orange stock are less liable to waste from the three sources under discussion than are those on sweet lime. Thus, the average four-year incidence of the two moulds, *D. natalensis*, and 'nooksan' in the January sour orange stock pickings, were 1·1, 0, and 3·8 per cent., respectively, the corresponding figures for March being 2·5, 3·9, and 2·4, respectively. For sweet lime the January averages were 3·4, 1, and 5·3, and those of March 3, 9·9, and 4·1, respectively.

In tests to determine the influence of the soil type on the various rots on Shamuti oranges budded on sweet lime, the average infection percentages of the two moulds, *D. natalensis*, and 'nooksan' in January-picked fruit on 'kurkar' soils were, respectively, 2·7, 4·1, and 7·8; on light soils 2, 1·3, and 4·5; and on heavy soils 0·3, 0·9, and 2·5; the corresponding March figures being 13·3, 11·7, and 16; 5·4, 3·7, and 6; and 2·2, 3·8, and 5·2, respectively. It is apparent from these data that wastage from all causes is heavier in fruit picked in March than in that picked in January, and that oranges grown on 'kurkar' soil are more liable to deterioration than those on the other types, of which the heavy was the more beneficial, also as regards firmness in keeping. Fruit from trees grown on 'kurkar' should be picked early to avoid serious losses.

Medium irrigation proved to be more favourable than either the maximum or minimum in two years' tests on Shamuti oranges on sweet lime stocks, the average percentages of the two *P.* spp., *D. natalensis*,

and 'nooksan' being 0, 1, and 1·4, respectively, for the medium plot, 1·1, 3·4, and 3·4 for the maximum, and 0·8, 1·2, and 3·9 for the minimum. The rots were more severe on the maximum and 'nooksan' on the minimum plot.

The best of six different fertilizing combinations tested for three years was one consisting of 2 kg. nitrochalk, 1 kg. superphosphate, $\frac{2}{3}$ kg. potash, and 4 kg. lime per tree, the average incidence of the two moulds, *D. natalensis*, and 'nooksan' in oranges picked at the beginning of February and end of March being 0·1, 0·1, and 5·4, and 5, 4·6, and 5 per cent., respectively, compared with maxima of 7, 10·9, and 13·5 per cent., respectively, in fruits from trees receiving other treatments.

Although definite conclusions as regards the effects of the following pre-storage factors on orange wastage would be premature at the present stage, experiments on the hours of picking tended to show a heavier incidence of *D. natalensis* in fruit gathered late (three-year average of 12 and 2·1 per cent. in the January and March pickings, respectively, as against 7·5 and 1·4, respectively, for early-gathered), while with 'nooksan' the reverse was the case, the early morning percentages in January and March being 10·2 and 6·1, respectively, compared with 7·1 and 2·6, respectively, for the later gatherings. The mould incidence did not differ appreciably in the two lots. Picking soon after rain increased the amount of mould in two years' trials (2·4 per cent. as against 1·3 in fruit left for two days), whereas *D. natalensis* and 'nooksan', especially the latter, were more abundant in dry fruit (2·9 and 46·8 as against 0·6 and 36·3 per cent., respectively, in fruit picked when wet). Wilting did not materially influence the amount of mould in oranges in three years' tests, but increased the incidence of *D. natalensis* in the March pickings (up to a maximum of 40·1 per cent. after four days in 1933), while that of 'nooksan' was diminished from 7·8 to 3·8 and from 5·9 to 2·3 per cent., in the January and March pickings, respectively, after seven days.

Bain (D. C.). **Effect of sulphuric-acid treatment on fungi and bacteria present on Cotton seed from diseased bolls.** – *Phytopathology*, xxix. 10, pp. 879–884, 1 fig., 1939.

Fewer fungi, including *Sordaria* (most commonly), *Diplodia natalensis*, *Fusarium moniliforme* [*Gibberella fujikuroi*: *R.A.M.*, xviii, p. 787], and *F. oxysporum*, and bacteria were isolated on potato dextrose agar from some 8,000 delinted cotton seeds from bolls infected by *Bacterium malvacearum* [loc. cit.] after 45 and 60 minutes' immersion in concentrated sulphuric acid than following shorter periods (15 and 30 minutes) of treatment, the average percentages from floating and sinking seeds [ibid., xviii, p. 105] for the 15-, 30-, 45-, and 60-minute dips being 37 and 11·9, 37·6 and 27, 29 and 12·2, and 14·2 and 16·1, respectively. The average germination of sinking seeds, as well as their health, were superior to that of floating material (90 as compared with 73·8 per cent.). An additional treatment of half the seeds in a 1 in 1,000 mercuric chloride solution in 50 per cent. alcohol did not appreciably affect either their fungal content or germinability. In a special test of 400 seeds treated in sulphuric acid for an hour and dissected aseptically, three colonies of *Bact. malvacearum* were recovered from the seed coat

and two from the embryo. All these cultures produced definite angular leaf spot lesions on young cotton plants sprayed with suspensions of them.

Vasudeva (R. S.) & Ashraf (M.). **Studies on the root rot disease of Cotton in the Punjab, VII. Further investigation of factors influencing incidence of the disease.**—*Indian J. agric. Sci.*, ix, 4, pp. 595–608, 2 graphs, 1939.

The results of experiments on the effect of soil temperatures of 25°, 30°, 35°, and 39° C. on cotton root rot (*Macrophomina phaseoli* and *Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xviii, p. 674] in the Punjab showed that mortality due to these two fungi was highest in soil maintained at 39° and 35°, respectively. *M. phaseoli* was actively parasitic at all the temperatures tested, while the parasitism of *C. solani* declined at temperatures above and below 35°. In another series of experiments, inoculated plants were placed in water tanks at soil temperatures of 20° and 35° for 24 hours and then transferred from 20° to 35° and from 35° to 20°, respectively. Inoculated and uninoculated controls were maintained at 20° and 35°. The results showed that the incidence of *C. solani* was definitely reduced by lowering the temperature from 35° to 20°, whereas such a fall did not materially affect the incidence of *M. phaseoli*. When the soil temperature was raised from 20° to 35° mortality due to both fungi was nearly as high as in controls kept at 35° throughout. High humidity and low temperature (in covered plots) appeared to be unfavourable to the spread of infection. Preliminary tests indicated that infection was significantly reduced by sowing a mixed crop of sorghum and cotton.

No difference was found in the texture and chemical composition of healthy and diseased soils, except that the latter contained a larger amount of acid soluble calcium than did the former, and had a higher calcium to magnesium ratio. There was no correlation between the P_H value of the soil and disease incidence.

Hart (F.). **Fungal infestation of powdered drugs.**—*J. Amer. pharm. Ass.*, xxviii, 6, pp. 374–376, 1939.

Eight drug powders susceptible to mould infection, viz., althaea, capsicum, cascara, ginger, liquorice, rhubarb, mustard, and sarsaparilla, were inoculated at the College of Pharmacy, New York City, with *Aspergillus niger*, *Penicillium glaucum*, and *Rhizopus nigricans* [cf. *R.A.M.*, xiv, p. 114]. The first- and last-named organisms grew most rapidly and profusely on althaea, while mustard was the preferred substratum of *P. glaucum*. Details are given of the appearance of the moulds on the various drugs, which are regarded as constituting a very valuable criterion for the differentiation of fungal cultural characters.

Christensen (B. V.) & Reese (J. A.). **Changes in ergot with various moisture contents under different conditions of storage.**—*J. Amer. pharm. Ass.*, xxviii, 6, pp. 343–360, 1939.

In connexion with a study at the School of Pharmacy, University of Florida, on the factors governing deterioration in stored [rye] ergot [*Claviceps purpurea*: *R.A.M.*, xviii, p. 314] of Spanish and Portuguese

origin, it is mentioned that mould [unspecified] developed in all the samples with a moisture content exceeding 9 per cent., but was absent from those with under 6 per cent.

VIÉGAS (A. P.). **Un amigo do fazendeiro Verticillium lecanii (Zimm.) n.comb., o causador do halo branco do Coccus viridis Green.** [A friend of the farmer, *Verticillium lecanii* (Zimm.) n.comb., the agent of white halo of *Coccus viridis* Green.]—*Rev. Inst. Café S. Paulo*, xiv, 150, pp. 754–772, 18 figs., 1939.

Following a summary and discussion of the previous literature on the host range, nomenclature, economic importance, and geographical distribution of the entomogenous fungus *Cephalosporium lecanii* [*R.A.M.*, xviii, p. 380], the writer describes the occurrence of the organism on the destructive coffee pest, *Coccus viridis*, in São Paulo, Brazil, and presents the results of his studies on its life-history, taxonomy, mode of transmission, practical application, and other points of interest.

In the Campinas district the fungus is inoculated by means of an ant, *Camponotus cameranoi*, into the cochineal larvae, which lose their natural green tint, shrivel, and are transformed into quasi-transparent pellicles, covered with a white fungal growth under humid conditions. Adult females are also deprived by the fungus of their gloss and colour, turning yellow and becoming encircled by a dense, white halo, averaging 1 mm. in diameter, composed of fasciculate conidiophores which give rise to apical hyaline conidia, abstricted distally into heads. Frequently a bundle of conidiophores, originating within the insect, proceeds by way of the anal aperture to the exterior, covering the middle and posterior of the body with a white tuft. Dead cochineal insects completely enveloped by the fungus break up into minute scales edged with a dirty white down. The hyphae never perforate the thick outer integument of the insects but rupture the underlying tissues to gain the exterior. When the insects are entirely consumed the intact integument remains attached to the leaf by means of the hyphae, the white fungal growth gradually acquiring a creamy or yellow tinge. All the internal parts, including the eggs and yeast cells, are destroyed.

The cochineal pathogen was named by Petch *C.* (*Acrostalagmus*) *lecanii* [ibid., v, p. 97], but in view of the invalidity of *A.* [ibid., xvi, p. 237] and the fact that the branching of the conidiophores is characteristic of *Verticillium*, the fungus is renamed *V. lecanii* (Zimm.) n.comb.

As regards the control of the insect by means of the fungus, the writer considers that the prospects of success are very encouraging. Two methods of application may be employed: one consists in affixing to the central, heavily shaded branches of infested plants leaves bearing diseased insects, and the other in spraying the attacked bushes with fungal suspensions in damp, warm weather.

VIÉGAS (A. P.). **Notas sôbre Septobasidium saccardinum (Rangel) Marchionatto.** [Notes on *Septobasidium saccardinum* (Rangel) Marchionatto.]—*Bol. téc. Inst. agron., Campinas*, 60, 14 pp., 4 pl., 1939.

The writer summarizes the knowledge previously available concerning the occurrence of *Septobasidium saccardinum* in Brazil [*R.A.M.*, xviii, p. 521] and presents his own observations on the fungus in associa-

tion with *Aspidiotus symbioticus* on mulberry samples received from the Itatiba district in 1938. The dimensions of *S. saccardinum* are stated to be as follows: probasidia 12 μ, basidia 50 by 8 μ, sterigmata 15 to 18 by 4 μ, and basidiospores 14 to 16 by 4 μ. Attempts to grow the fungus in pure culture have hitherto, contrary to Rangel's experience, given negative results.

Catanei (A.). **Étude des teignes des animaux en Algérie.** [A study of animal ringworms in Algeria.]—*Arch. Inst. Pasteur Algér.*, xvii, 3, pp. 520–529, 1 pl., 1939.

Equine mycoses in Algeria have been found to be due in the first place to *Microsporon equinum* [*R.A.M.*, xvi, p. 383], *Ctenomyces* [*Trichophyton*] *mentagrophytes* [ibid., xviii, p. 737] and *M. canis* [ibid., xviii, p. 393] being of secondary importance; *M.* [*Achorion*] *gypseum* [ibid., xvii, pp. 36, 395] was observed once on an ass. *T. discoides* [ibid., xvii, p. 395] is responsible for ringworm in calves and occasionally in sheep, from which *T. pruinosum* [ibid., xiii, p. 577] has also been isolated. Dogs are liable to infection by *M. canis*, *T. mentagrophytes*, and *Achorion schoenleini*.

Delamater (E. D.). **The Squirrel as a new host to a ringworm fungus.**—*Mycologia*, xxxi, 5, pp. 519–526, 4 figs., 1939.

The ringworm fungus *Trichophyton mentagrophytes* [see preceding abstract] was isolated in pure culture from typical tinea lesions on common grey squirrels living on and near the campus of the Johns Hopkins University. In culture on various media the fungus formed branching clusters of aerial hyphae, micro- and macroconidia, various types of aleuriospore fruiting, racquet mycelium, chlamydospores, spirals, nodular organs, and subsurface hyphae, and these structures are figured. The disease was successfully transmitted to squirrels, cats, and rabbits and in two cases accidental infection of human subjects occurred.

Terasi (T.). **Studien über die Otomycosis, insbesondere 'Otomycosis aspergillina'.** [Studies on otomycosis, especially 'otomycosis aspergillina'.]—*Fukuoka Acta med.*, xxxii, 9, pp. 1449–1537, 3 pl., 1939. [Japanese, with German summary on pp. 87–88.]

Thirty cases of otomycosis aspergillina were observed by the author in 1936 among the 3,952 patients visiting the oto-rhino-laryngological hospital at Fukuoka, Japan, distributed as follows within the genus *Aspergillus* [*R.A.M.*, xviii, p. 313]: *A. hortai* [ibid., xvii, p. 599] 11, *A. sydowi* [ibid., xvii, p. 243] 3, *A. flavus* 9, *A. versicolor* 1, *A. ochraceus* 1, *A. fumigatus* 2, *A. nidulans* [ibid., xvi, p. 317] 2, and *A. niger* 1. Details of the physiological characters of these species are given.

Lacaz (C. Da S.). **Cultura do escarro para pesquiza de cogumelos. Fungos productores de mycoses broncho-pulmonares.** [Culture of the sputum for the identification of fungi. Fungi responsible for broncho-pulmonary mycoses.]—*Brasil-med.*, liii, 13, pp. 393–399; 14, pp. 421–428, 8 figs., 1 diag., 1939. [English summary.]

This is a summary of the available knowledge of the fungi associated with broncho-pulmonary disturbances, with special reference to Brazil, where representatives of the families Eremascaceae Imperfectae and

Aspergillaceae are the chief occupants of the sputum of pseudotuberculous patients.

Cox (A. J.) & Smith (C. E.). **Arrested pulmonary coccidioidal granuloma.**—*Amer. Rev. Tuberc.*, xxvii, 4, pp. 717–734, 8 figs., 1939.

Four cases of completely arrested coccidioidal granuloma (*Coccidioides immitis*) [*R.A.M.*, xviii, p. 800] of the lungs or bronchial lymph nodes are reported, all in men over fifty, in none of whom were the lesions a factor in the cause of death. Similar arrested lesions could be induced at will in white rats or guinea-pigs by intravenous injections of relatively small numbers (up to 1,000 or in some cases 5,000) of spherules of a virulent strain of the fungus, the minimum fatal dose being 10,000. In nearly all the arrested experimental lesions the causal organism remained viable for periods up to 2½ years, while in one of the human cases it was cultured on Sabouraud's dextrose agar 15 years after its first detection. It is concluded that instances of arrested coccidioidal granuloma are more frequent than has hitherto been recognized, probably outnumbering the fatal cases of the disease, and that they are not restricted to the San Joaquin Valley of California.

Sartory (A.), Sartory (R.), & Meyer (J.). **Deux cas d'onychomycose humaine dus, l'un au Trichophyton acuminatum, var. pilosum, l'autre à l'Hemispora stellata Vuillemin.** [Two cases of human onychomycosis, one due to *Trichophyton acuminatum* var. *pilosum* and the other to *Hemispora stellata* Vuillemin.]—*Ann. Inst. Pasteur*, lxiii, 3, pp. 257–268, 6 figs., 1939.

Clinical, cultural, morphological, and serological particulars are given of two cases of onychomycosis at Strasbourg, Alsace-Lorraine, one due to *Hemispora stellata* [*R.A.M.*, xvii, p. 38] in a 36-year-old man and the other caused by *Trichophyton acuminatum* var. *pilosum* in a 42-year-old woman. Both fungi gave positive results in inoculation experiments on guinea-pigs.

Castellani (A.). **Viability of some pathogenic fungi in distilled water.**—*J. trop. Med.* (*Hyg.*), xlii, 15, pp. 225–226, 2 figs., 1939.

On 10th July, 1939, transfers to glucose agar were made from tubes of distilled water inoculated on 5th July, 1938, with *Monilia* [*Candida*] *krusei*, *M.* [*C.*] *pinoyi*, *M.* [*C.*] *tropicalis*, *M.* [*C.*] *pseudotropicalis* [*R.A.M.*, xviii, p. 525], *M.* [*C.*] *macedoniensis* var. *macedoniensoides* [loc. cit.], *Geotrichum rotundatum*, *G. matalense* [ibid., xii, p. 117], *G. asteroides*, *G. rugosum*, *Epidermophyton floccosum* [ibid., xviii, p. 677], *Cladosporium* [*Sporotrichum*] *mansoni* [ibid., xii, p. 246], *Aleurisma* (*Acladium*) *castellanii* [*S.? schenckii*: ibid., xvi, p. 608], and *Actinomyces sylvodoriferus*. Typical growth was made within the normal period by all the fungi. The strain of *E. floccosum* used retained its pleomorphic characters unaltered.

Leccisotti (R.). **Miceti come agglutinogeni (saggi di agglutinazione con due Criptococchi patogeni per l'uomo).** [Fungi as agglutinogens (agglutination experiments with two *Cryptococci* pathogenic to man).]—*Pathologica*, xxxi, 572, pp. 243–244, 1939.

From rabbits immunized with two species of *Cryptococcus*, *C. uvae*

[*R.A.M.*, xvi, p. 385] and *C.* [*Candida*] *pinoysimilis* [ibid., xviii, p. 313], isolated from human mycoses of the tongue and tonsils, respectively, the writer obtained sera agglutinating at the high dilutions of 1 : 3,200 to 1 : 6,400.

Benham (Rhoda W.). **The cultural characteristics of Pityrosporum ovale—a lipophylic fungus.**—*J. invest. Derm.*, ii, 4, pp. 187–203, 2 pl., 3 figs., 1939.

Full details are given of the writer's successful experiments at the College of Physicians and Surgeons, Columbia University, New York, in the culture of *Pityrosporon ovale* from dermatitis of the human scalp [*R.A.M.*, xviii, p. 394]. In addition to the wort agar used by Moore [ibid., xiv, p. 696], Petroff's egg medium plus gentian violet and Sabouraud's honey agar with fatty substances proved to be suitable substrata. Of the fats tested for incorporation in wort agar, butter and oleic acid gave the strongest stimulus to growth, followed by lanoline, pork and chicken fats, and linseed oil. The fungus was present, in the typical form of bottle-shaped bodies, 2 to 3 by 0·8 to 1·5 (average 2 by 0·8) μ, in the methylene blue preparations from 28 out of 30 cases examined, and 5 of the 8 apparently identical strains were subcultured (one through 25 generations in a little over a year). Inoculation experiments on rabbits gave negative results.

Besides *P. ovale*, 24 strains of *Cryptococcus* [*Torulopsis*: ibid., xvii, p. 676] were isolated from the scalps examined in the course of these studies, 11 falling into group (1), 2 into (2), 4 into (3), and 7 into (4) [ibid., xv, p. 153]. One of the strains assigned to group (1) appears to be a new species with flat, cream-coloured, finely corrugated colonies producing acid and gas from dextrose, and forming oval budding cells, 2·5 to 4·5 μ in diameter, and spindle-shaped cells, frequently joined end to end and constituting a pseudomycelium.

Gougerot (H.), Degos (R.), & Duché [J.]. **Pityriasis versicolor achromiant, riche en parasites, non fluorescent à la lumière de Wood.** [Achromatic pityriasis versicolor, rich in parasites, non-fluorescent in Wood's rays.]—*Arch. derm.-syph., Paris*, xi, 4, pp. 365–366, 1939.

The writers examined in Paris a case of pityriasis versicolor simulating leprosy in a 34-year-old woman resident for 20 years in Madagascar. *Malassezia furfur* [*R.A.M.*, xviii, p. 311] was present in abundance in scrapings from the numerous white patches on the arms, which were thrown into sharp relief under the action of Wood's rays [ibid., xvii, p. 530], appearing non-fluorescent and of a very pale yellow tint.

Békésy (N. v.). **Untersuchungen über den Alkaloidgehalt des Mutterkornes. I. Mitteilung: Über die quantitative Bestimmung der Mutterkornalkaloide in einzelnen Sclerotien.** [Studies on the alkaloid content of ergot. Note I: On the quantitative determination of the ergot alkaloids in individual sclerotia.]—*Biochem. Z.*, cccii, 3–4, pp. 187–197, 3 figs., 3 diags., 1 graph, 1939.

In connexion with the writer's recent experiments in the intensive production of rye ergot [*Claviceps purpurea*] in Hungary [*R.A.M.*,

xviii, p. 314] it is pointed out that any attempts at the improvement of the crop by selection must be preceded by a quantitative analysis of the alkaloid contents of individual sclerotia. The method whereby this is effected is fully described, and it is stated that some of the 800 sclerotia already examined contain over 1 per cent. total alkaloids, representing ten times the amount required in a good commercial product and over 20 times the minimum of 0·05 per cent. laid down by the German pharmacopoeia.

Scossiroli (R.). **La riproduzione della Claviceps purpurea applicata alla coltivazione.** [Reproduction in *Claviceps purpurea* applied to cultivation.]—*Riv. ital. Essenze*, xxi, 9, pp. 442-444, 8 figs., 1939.

With a view to stimulating the interest of Italian agriculturists in the extended production of home-grown ergot of rye (*Claviceps purpurea*) [see preceding abstract], the writer gives a concise account of the life-history of the fungus and briefly discusses the mode of infecting the ovaries of the flowering plants by means of ascospores from stored sclerotia. It is pointed out in this connexion that entomological studies are requisite to determine the identity of the insects which play such an important part in the propagation of *C. purpurea*, so much so, in fact, that only relatively few flowers need be exposed to primary infection by the means indicated above.

Elkin (H. A.) & White (W. A. S.). **Rot-proofing of Jute.**—*J. Text. Inst., Manchr*, xxx, 9, pp. P. 340–P. 346, 1939.

After a brief survey of the situation regarding rot-proofing of jute [cf. *R.A.M.*, xviii, p. 527], the authors express the view that there are two possible methods of treatment, (*a*) impregnation and (*b*) chemical modification of the fibre, but that to be of universal value each must include a protective action against sunlight as well.

All the better-known rot-proofing compounds tested in soil incubation tests proved to be effective in increasing the resistance of jute to micro-organisms, complete protection for all practical purposes being obtained with copper compounds (copper oleate, copper naphthenate, and commercial cuproammonium) containing over 1 per cent. copper, and with a proprietary compound containing only 0·6 per cent. copper. Zinc naphthenate also gave complete protection, yielding strikingly better results than zinc oleate, apparently owing to the action of salts of naphthenic acid. Treatment with 5 per cent. cutch solution, followed by immersion in 0·5 per cent. potassium bichromate, gave only fair protection from micro-organisms but exerted a very marked action against sunlight. Most of the other treatments exerted very little effect on the weakening of jute due to the action of sunlight.

Two satisfactory methods of impregnation are outlined, the rot-proofing compound being dissolved in a volatile solvent in one and emulsified in water in the other, and several methods of chemical modification are mentioned.

In a discussion of the subject by H. C. Bryson on pp. P. 346–P. 349 it is pointed out that the solvent employed for the solution of the preservatives exerts a great influence on the results, naphtha proving best on cotton, followed by alcohol and alcohol-naphtha mixtures.

Aluminium naphthenate is recommended as a waterproofing agent for copper naphthenate to prevent too rapid wasting of the latter under very wet conditions. Experimental treatment with copper naphthenate (commercial brand 'Concentrate') extended the life of hessian and twilled hessian from 3 to 4 to about 14 to 20 weeks and that of jute tarpaulin to between 20 and 30 weeks. It was found that two dips in a 10 per cent. solution of copper naphthenate were more effective than one in one of 20 per cent , and that about 0·04 per cent. metallic copper as naphthenate is about the minimum for effective protection. Untreated hessian, twilled hessian, and jute tarpaulin decayed when buried in a soil of a P_H value of 8·1 after 8 to 12 weeks, whereas treatment with copper naphthenate so as to give a deposit of about 0·08 per cent. of copper on the weight of the dry jute extended their life to 9 to 12 months.

In a further contribution to the discussion by J. G. Brockbank and D. A. Oury on pp. P. 349–P. 351 it is stated that although certain rot-proofing treatments tend to reduce the tensile strength of fabrics, the writers observed on several occasions that the tensile strength was increased after proofing with metallic naphthenates. High copper contents increase light tendering and the metal content should therefore be kept as low as is compatible with efficient protection. In tests with proprietary compounds manufactured from naphthenates, metal contents of 0·25 per cent. copper and 0·5 per cent. zinc gave complete protection after burying in the soil for eight weeks. The use of emulsions for impregnation is stated to require less equipment and to be more economical than that of solvents; sandbag hessian, for instance, being treated by the former method in Dundee for $\frac{7}{8}d.$ per yd. of fabric 40 in. wide, while the corresponding cost for treatment by the latter method would be $1\frac{3}{4}d.$ per yd. It is believed that rot-proofed jute should be able to compete successfully with cotton or flax. Comments on the discussion are given by the authors of the original paper on p. P. 429 of part 10 of the same journal.

Haasis (F. A.). **White streak, a virus disease of Narcissus.**—*Phytopathology,* xxix, 10, pp. 890–895, 1 fig., 1939.

White or silver streak of narcissus [*R.A.M.*, xix, p. 21], generally confused with mosaic, was first observed in commercial plantings on Long Island in 1931, having probably been present earlier. Early symptoms consist of dark green streaks, 1 to 7 or more cm. by 0·5 to 2 mm., closely associated with the vascular elements of the leaf blade. About three or four weeks after the flowering period the streaks turn white, grey, or yellowish-white and may coalesce. Similar symptoms are conspicuous on the flower stems. In forced greenhouse Bicolor Victoria plants maintained at minimum temperatures of 40°, 50°, 58°, 68°, and 80° F., late symptoms developed only at the two last, indicating that heat plays an important part in this manifestation of white streak. Affected leaves are not roughened as in the case of mosaic. The infective principle persists from year to year in vegetatively propagated bulbs; the symptoms are of the mosaic type and unconnected with any visible micro-organism; and the disease is readily transmissible from infected to healthy plants by mechanical methods.

of which Rawlins and Tompkins's carborundrum abrasive [ibid., xv, p. 737] was the most effective. For these reasons white streak is assumed to be caused by a virus. In the writer's inoculation experiments plants of the Minister Talma [daffodil: *Narcissus pseudo-narcissus*] variety, which does not appear to contract the disease naturally, were inoculated with dilute (1 in 5) sap from white-streaked King Alfred and Glory of Sassenheim leaves. No symptoms developed during the current season, but after a year's dormancy bulbs from the inoculated plants gave rise to typically white-streaked individuals (60 out of a total of 301).

Although actual proof is still lacking, observational evidence tends to support the theory that the white streak virus is closely related to that of mosaic. The two are so seldom encountered in the same plant that an immunizing effect of one against the other may plausibly be inferred.

The eradication of diseased plants and the isolation of healthy foundation plantings are the sole known methods of control.

GREGORY (P. H.). **Narcissus leaf diseases. II.**—*Daffodil Yearb., 1939*, pp. 49–53, 3 figs., 1939.

A preliminary account is given of experiments carried out at different centres in west Cornwall and the Scilly Isles to ascertain the effect of the narcissus leaf diseases, scorch (*Stagonospora curtisii*) [*R.A.M.*, xvii, p. 42], white mould (*Ramularia vallisumbrosae*) [ibid., xviii, p. 598], fire (*Sclerotinia polyblastis*) [ibid., xviii, p. 32], and grey mould (*Botrytis narcissicola*) [ibid., xvii, p. 42] upon the bulb and flower crop. The results showed that crop losses may be direct or indirect. Direct losses are caused when any of these fungi pass from the foliage to the flowers. *R. vallisumbrosae* may rot the flower stalks, especially of varieties of *Narcissus poeticus*. Heavy losses of the flowers of *N. tazetta* and *N. poeticus* parentage, and also of Trumpet and Incomparabilis types may result when the perianth is spotted by spore infections by *Stagonospora curtisii*, *Sclerotinia polyblastis*, or *B. narcissicola*. Direct loss of flowers largely depends on the occurrence of weather favourable to infection when the flower buds are opening.

Indirect losses from leaf diseases are sustained when the bulb loses its foliage prematurely, as in such cases the bulbs remain small and produce fewer flowers than healthy ones.

Preliminary tests showed that *R. vallisumbrosae* and *S. polyblastis* are readily controllable by spraying the foliage with Bordeaux mixture [strength not specified] and this treatment was adopted as a standard throughout the experiments. Observations were made on the effect of spraying on bulb number, weight, grade, and flowering capacity, including flower number and quality. In a commercial stock of Golden Spur lifted after spraying for two successive seasons, it was found that bulb yield was about 40 per cent. heavier than in unsprayed, infected plots and still higher gains were recorded after three seasons. This increase in yield was due to the greater weight of individual bulbs and not to an increase in their number. The heavier bulbs gave a larger flower crop than the controls, but the difference in yield between sprayed and unsprayed plots varied considerably depending upon a number of factors. In one test a gain of 50 per cent. over the flower crop from unsprayed plots was obtained on double-nosed Golden Spur bulbs protected for

one season from *R. vallisumbrosae*, the gain after the second season rising to 70 per cent. Single-nosed bulbs gave increases of 15 and 56 per cent. over the flower crops from the unsprayed controls after the first and second seasons, respectively. As a result of an artificially induced epidemic of *R. vallisumbrosae* the flower yield of Golden Spur was reduced in the following season by 20 to 50 per cent. compared with the untreated plots. Evidence was obtained that flower crop increases of 20 to 30 per cent. can be secured on Soleil d'Or narcissus in the Scilly Isles as a result of controlling *S. polyblastis* by copper sprays. As regards flower quality, it was found that the weight of individual flowers from Golden Spur plants kept free from leaf diseases for two seasons was appreciably greater than that of untreated plants.

Under certain weather conditions considerable scorching of the leaf tip may follow applications of Bordeaux mixture, though the amount is negligible in comparison with the damage caused by fungus attack. A retardation of the date of flowering, probably extending to several days, was observed on sprayed plants of the Golden Spur variety.

Tentatively it is suggested that a single spraying after the flowers have been picked should usually suffice for control, but if the beds were heavily infected the previous year an earlier application is desirable. Sanitary measures should also be enforced.

Pickel (B.). **O mildio da Roseira em S. Paulo.** [Rose downy mildew in S. Paulo.]—*Biologico*, v, 9, pp. 192–194, 1939.

Rose downy mildew (*Peronospora sparsa*) [*R.A.M.*, xvii, p. 797] has been detected in São Paulo, Brazil, where the fungus overwinters by means of its mycelium, and not, as in cool and temperate climates, with the aid of oospores. Directions for control by prophylactic applications of standard fungicides are briefly indicated.

Santarelli (M.). **Su di una batteriosi della Violacciocca.** [On a bacteriosis of Stock.]—*Riv. Pat. veg.*, xxix, 7–8, pp. 359–365, 2 figs., 1939.

During the spring of 1939 stocks [*Matthiola incana* var. *annua*] in the Botanical Gardens at Palermo developed on the leaves small, chlorotic, irregular spots which gradually enlarged until they covered the entire leaf surface. The disease had been present in a milder form for some years. Both the plants and the affected leaves were reduced in size, the upper leaves forming a sort of rosette. The leaves also bore protuberances on the under surface, were malformed and wrinkled, and rapidly withered and fell. The development of the inflorescences was arrested, and the commercial value of the flowers was diminished. Diseased material showed the presence of a cylindrical, straight, rod-shaped organism, 4 to 6 by 0·8 to 1 μ, which was Gram-negative, reduced nitrates, coagulated milk, and fermented carbohydrates. The author considers the disease to be closely similar to that described by Briosi and Pavarino as due to *Bacterium matthiolae*, but agrees with Burkholder in regarding this organism as identical with *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xviii, p. 257].

Nattrass (R. M.). **A new species of Phleospora on Dodonaea viscosa L. in Cyprus.**—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 269–270, 1 pl., 1939.

In March, 1938, hedges of *Dodonaea viscosa* near Famagusta, Cyprus, developed an epidemic outbreak of a leaf spot, which appeared a few weeks later at Nicosia, about 45 miles away, and by April, 1939, had become established wherever the host was present. The affected leaves bore numerous small, black lesions, each, as a rule, with an acervulus, measuring up to 200 μ deep by 200 μ broad. The hyaline, cylindrical, curved, occasionally straight, 1- to 5- (usually 3-) septate conidia measured 50 to 90 by 3 to 5 μ, tapered abruptly at each end, had a rounded distal and truncate proximal end, and were borne on short, obclavate conidiophores arising from the lower part of the acervulus. The fungus is named *Phleospora dodonaeae* n.sp. [with a Latin diagnosis].

Germar (B.). **Untersuchungen über Ceratophorum setosum Kirchn. auf Lupinus albus.** [Investigations on *Ceratophorum setosum* Kirchn. on *Lupinus albus*.]—*Z. PflKrankh.*, xlix, 7–9, pp. 482–509, 9 figs., 1 map, 1939.

Ceratophorum setosum attacks the leaves, stems, pods, and seeds of white lupins (*Lupinus albus*) [*R.A.M.*, xviii, p. 655] in Germany, where attempts are in progress to extend the cultivation of this promising fodder crop. On young leaves infection assumes the form of blackish-brown spots the size of a needle-prick, which do not expand with age, though if many are present they may converge into large, dark brown, necrotic areas. In the case of older foliage the affected tissues rapidly sink and turn a dull greyish-green, the lesions developing later into circular or very irregular, dark brown, concentrically zonate areas, up to 10 mm. in diameter, on both leaf surfaces, often becoming much paler as the healthy portions of the leaf are approached. The diseased leaves wilt and may be shed. On the branches and leading shoot the lesions are elongated-oval, up to 20 mm. in length, with sharply alternating light brown and black zones. The pods show two types of infection, one characterized by deeply sunken, highly irregular spots, up to 20 mm. in diameter, at first translucent, later black and often velvety, while the other is manifested by smaller, also irregular, light brown, shiny lesions with a chestnut border. In both cases the fungus attacks the seeds, causing a brown discoloration of the seed coat, whence infection may pass to the cotyledons or the embryo and impede germination and subsequent development to a greater or lesser extent. As a rule, however, the fungus stops short at the cotyledons. Conidia are formed in profusion on the older leaves, on the stems, and especially on the black pod lesions. The germ-tubes enter the plant through the stomata and the mycelium traverses the leaf to the opposite epidermis. Chlamydospores in chains or strands may be found here and there in the invaded tissues, especially those underlying the light brown pod lesions. The growth of the fungus is intracellular, the vessels remaining free from mycelium. In the final stages the mycelium grows outwards through the stomata or epidermis and abstricts conidia.

It is estimated that up to 25 per cent. of the leaf surface of white

lupins may be infected by *C. setosum* and thereby excluded from assimilation. The weights of 1,000 healthy and 1,000 brown-spotted seeds were 329 and 263 gm. respectively, representing a loss of 20 per cent. from the disease. Even more significant is the deterioration in the quality of the infected seed, 100 five-week-old plants raised from which weighed 28 per cent. less than the normal and showed a corresponding decline in length of 23 per cent. The full economic importance of the brown spot disease cannot be gauged on the basis of the present scanty field observations, but during the last three years infection reached 100 per cent. in five East Prussian experimental areas, in one of which the cultivation of the white lupin was abandoned in consequence.

Of the various nutrient media on which the fungus was cultured, potato decoction agar was the most suitable for rapid conidial production, followed by oatflakes and oatflake-yeast-agar, while chlamydospores were abundant on carrot decoction, oatflake-glucose-saccharose, yeast-glucose-saccharose, and biomalt agars. Mature hyphae are mostly irregularly sinuous, light to dark brown, closely septate, and 7 to 13 μ in diameter. The dark-coloured chlamydospores measure 11 to 24 μ in diameter and frequently form coils which anastomose with each other and with the hyphae. The slightly curved conidia are sepia in the centre and light brown or subhyaline at the ends, 54 to 84 by 13 to 19 (average 69 by 16) μ; the apical cell bears 1 to 5, usually 3, appendages, 46 to 120 by 3 μ, which may undergo di- or more rarely trichotomous division. The conidia either arise directly from the mycelium or are borne on protuberant, sinuous conidiophores of about the same diameter as the hyphae.

The minimum, optimum, and maximum temperatures for mycelial development on malt agar were found to be 4°, 23°, and between 32° and 35° C., respectively; chlamydospore formation began at 18° and increased in abundance up to 32°. The thermal death points of the mycelium and chlamydospores were 42° and slightly above 48°, respectively (six hours' exposure). Conidial germination reached a maximum (98 per cent.) at 23° to 27°, falling to 10 per cent. at 5° and to 8 and 0 per cent. at 32° and 35° respectively.

In inoculation experiments with *C. setosum* on white lupin leaves and pods, after 36 hours the incidence of infection on the former rose from 60 per cent. at 9° to 11° to 88 at 28°, and on the latter from 0 to 75 per cent.; after 72 hours 100 per cent. was obtained at all temperatures. In germination trials the percentages of emergence of brown-spotted seed after a fortnight at 7°, 13°, and 19° were 48, 57, and 62, respectively, 14, 22, and 19 per cent., respectively, of the plants being infected, whereas the emergence of healthy seed at 13° amounted to 99 per cent. with no disease. The results of inoculations on the leaves and pods of plants 15, 25, 55. 70, and 90 days old showed the existence of strong defensive reactions in the young foliage, spore formation commencing only on plants beginning to flower, while the pods remained immune until the final phase, when they contracted heavy infection.

The host range of *C. setosum* was shown to embrace 22 species of *Lupinus*. The disease was further transmitted to *Cytisus laburnum* [*Laburnum vulgare*] and *C. capitatus*, and conversely. Of the more im-

portant hosts, *Lupinus angustifolius* showed the mildest symptoms, consisting in a brownish-purple foliar spotting of no economic significance. *L. luteus* reacts similarly to the white lupin, except that the spots are smaller and the hirsute pods seldom contract infection in the field. On *L. polyphyllus* the lesions are irregular, concentrically zonate, dark to blackish-brown with a light brown centre, up to 3 cm. in diameter. The very irregular, often confluent areas of infection on *Laburnum vulgare* and *C. capitatus* are sharply delimited, pale with an intensely dark brown border on the upper side, rust-coloured with a less dark edge below. Premature defoliation may occur in severe attacks.

During the growing period infection is spread by means of the conidia, the production of which reaches a climax on the ripening pods, so that widespread dissemination may be expected from mid-July onwards. Only two observations have been made on the range of the conidia, in which they failed to cover distances of 200 and 400 m., respectively. As regards overwintering, heavily infected *Lupinus polyphyllus* plants put out completely healthy leaves and inflorescences in the following spring, but early in July a severe attack commenced at the base, evidently originating in fallen diseased leaves of the previous season. On infected white lupin pods overwintered indoors the conidia were still viable to the extent of 80, 45, and 7 per cent. in the following May, July, and September, respectively, whereas the viability of those left in the open amounted to only 1 per cent. in February and nil in March. New conidia, evidently arising from chlamydospores, were produced in abundance at the end of May.

A study of the distribution of *Ceratophorum setosum* in Germany showed it to be largely confined to the eastern regions, where the prevailing climatic conditions are possibly not altogether congenial to the white lupin. Another factor to be considered is the widespread occurrence in the forests of the affected zone of *L. polyphyllus*.

In seed disinfection tests the best results were given by dusting with ceresan, which increased the emergence of severely diseased seeds from 46 to 74 per cent. and reduced the incidence of infection from 12 to 8 per cent. The emergence of seeds immersed for 40 minutes in 0·1 and 0·2 per cent. ceresan was 66 and 64 per cent., respectively, and the infection percentages 8 and 4, respectively. A considerable reduction of pod-spotting was obtained by the application of 1 or 1·5 per cent. Bordeaux mixture on 15th July. Early sowing (14th April) was found to promote resistance to *C. setosum*. Early harvested seeds (a fortnight before the usual time) showed 69 per cent. emergence and 6 per cent. infection compared with 39 and 9 per cent., respectively, for the normal date.

Jones (F. R.). **Evidence of resistance in Sweetclover to a Phytophthora root rot.**—*Phytopathology*, xxix, 10, pp. 909–911, 1939.

A sweet clover [*Melilotus*] root rot occurring in Ohio, Indiana, Illinois, Wisconsin, and elsewhere in the United States is characterized by a soft, watery decay extending downwards from the crown for a distance of up to 8 in., followed by desiccation, shrinking, and discoloration of the affected tissues and accompanied in hot spring weather by wilting of the plants. The disease, which is caused by a *Phytophthora* identified by Drechsler as *P. megasperma* [*R.A.M.*, xi, p. 303; xvii,

p. 476; xviii, p. 646] is most prevalent in damp, low-lying sites in the field or near the roadside, and mainly attacks young, poorly developed plants. In inoculation experiments carried out in connexion with a search for resistant strains infection took place with equal severity over a soil temperature range of 10° to 24° C. The most convenient method was to introduce mycelium from an agar culture below the bark of roots stored in sand in a cold frame from the late autumn until January or after. When the rot is sufficiently advanced for the roots to be sorted, the survivors are given a second inoculation and set in soil. So far the only resistant plants have been obtained from a few selected strains of white sweet clover [*M. alba*], including one of foreign origin. Thirteen of the progenies from selfed seed of the resistant selections sown in 1938 yielded 50 to 75 per cent. healthy plants compared with only 10 per cent. from the offspring of an unselected sister plant, so that resistance to the root rot can evidently be appreciably increased by this means.

Jones (F. R.). **Four fungus parasites of Sweetclover infecting seed.**—*Phytopathology*, xxix, 10, pp. 912–913, 1939.

In addition to the causal organism of stem blight (*Ascochyta caulicola*) [*R.A.M.*, xviii, p. 35], sweet clover (*Melilotus*) seed in Wisconsin bore *Cercospora zebrina* (?) [ibid., xvii, p. 507], *Leptosphaeria pratensis* (*Stagonospora meliloti*) [ibid., xv, p. 632], and *Mycosphaerella lethalis* [ibid., xviii, p. 35]. The examination of 27 samples from farms in the State germinated on potato dextrose agar showed 13 to be infected by the *Cercospora* and six each by *A. caulicola* and *S. meliloti*. No external evidence of their presence in the seed was detected, nor did they appear to cause any direct damage to the seedlings. The *Cercospora* fruited profusely on the discarded seed coat in five to seven days at room temperature. *M. lethalis* did not occur in these commercial lots, but was isolated from seed of severely infected *Melilotus dentata* plants in an experimental plot.

Rodighin (M. N.) & Petroff (P. A.). Вилт, или увядание Донника и Люцерны. [Wilt of Sweet Clover and Lucerne.]—'25 years of Saratoff Agricultural Institute', Saratoff, pp. 176–185, 1939.

A wilt and root rot of white sweet clover (*Melilotus alba*) is responsible in part for the low yields of this crop in south-eastern Russia. The disease was observed near Saratoff, where it caused a stunting of the plants, which produced small, discoloured leaves, sometimes curled and mottled. Affected plants usually died within two years. Bacteria were found in the vascular bundles and adjacent tissues. From the diseased tissues was isolated a bacterium which is identified as *Bacterium radiciperda* [*R.A.M.*, xi, p. 652], the only divergence from the description of the type being the size of the rod (1·2 to 2 by 0·4 to 0·6 μ) and the apparent absence of flagella. It was capable of growing on most media except Cohn's and of decomposing starch; in bouillon growth was cloudy, with a white pellicle, later turning yellow, causing the formation of a precipitate. An unidentified species of *Fusarium* was a frequent secondary invader of wilted plants and is said to be responsible for an intensified decay of the root system.

Among the standard varieties of sweet clover from the Saratoff Selection Station tested in the field, 19 were resistant, while others ranged from medium to very susceptible. A wilt of lucerne observed in the same vicinity also yielded the same bacterium.

TEHON (L. R.). **Two new fungi on legumes.**—*Mycologia*, xxxi, 5, pp. 537–543, 1 fig., 1939.

Descriptions, with Latin diagnoses, are given of two new pathogenic fungi in Illinois, *Placosphaeria medicaginis* n.sp. on leaves of lucerne, and *Catosphaeropsis caulivora* n.g., n.sp. on stems of *Lespedeza stipulacea* [*L. striata*]. Both the diseases are stated to be of limited economic importance, lowering the vigour of the host plants but having little effect on the yields. *P. medicaginis* affects the lucerne leaves at one or more points, most commonly on one side of the mid vein only, the lesions turning yellow and the entire leaf blade assuming finally a corrugated appearance. Within the infected regions small, black areas develop, bearing multilocular stromata up to 1 cm. long. The locules are amphigenous, spherical or flattened, mostly single but often confluent and then appearing to be compound, measuring 75 to 140 μ in width and 75 μ in height; no true ostioles are formed. The spores are oblong, hyaline, and confluent, 3 to 7 by 1·5 to 2 μ.

The disease on *Lespedeza* is characterized by lesions which at first appear as elongated, dark-coloured areas between the nodes of the stem and on the lateral branches. Eventually all parts of the plant lying beyond the stem lesion are killed. Minute, shining, black pycnidia, 120 to 200 μ in diameter, develop on the lesions, often in longitudinal rows, and about the same time the leaves drop off. The pycnidia are rather more than hemispherical, with an incomplete base; at maturity the papilla breaks off, leaving an irregularly circular pore, up to 25 μ in diameter. The walls are membranous and the conidia-bearing layers are borne at the dome; the conidia are brown, continuous, oblong to ovate or tapering to the base, and measure 16 to 27 by 9 to 12 μ. Although the fungus resembles *Sphaeropsis* in many of its characters, it is, in the author's opinion, more accurately placed in the Leptostromataceae on account of the incompleteness of its pycnidium and its inverted method of sporulation. A new genus is consequently erected within this family for the species.

VIDAL (J. L.). **A propos du traitement contre la chlorose calcaire des arbres fruitiers.** [On the treatment of lime-induced chlorosis of fruit trees.]—*Progr. agric. vitic.*, cxii, 48, pp. 394–396, 1939.

The information in this paper has already been noticed from another source [*R.A.M.*, xvii, p. 472].

HENRICK (J. O.). **Apple black spot (Venturia inaequalis) investigations. Eradicant experiments—preliminary report.**—*Tasm. J. Agric.*, N.S., x, 3, pp. 150–151, 1939.

In preliminary tests carried out in Tasmania in the winter of 1937 thirteen lots of apple leaves heavily infected with *Venturia inaequalis* [*R.A.M.*, xvii, p. 118; xviii, p. 236] were sprayed in the laboratory with, respectively, urea, sulphate, chloride, and carbonate of ammonia,

sulphate and chloride of potash (all at rates of 1 and 2 lb. per gal.), and commercial lime-sulphur (1 in 8), and placed in a spore trap box out of doors. The treated leaves yielded no ascospores, though untreated control leaves in similar boxes discharged ascospores on four occasions during the progress of the experiment.

In the winter of 1938 leaves in infected orchards were sprayed with either sulphate of ammonia or sulphate of potash (10 and 20 per cent.), lime-sulphur (1 in 8), chloride of ammonia (5, 10, and 15 per cent.), or chloride of potash (at similar strengths). No ascospore discharge took place from the treated leaves, though discharges occurred from the untreated controls. Dry weather prevailed and the treatments require further testing under wet and normal conditions.

Control of black spot of Apples and Pears.—*Fruit World, Melbourne*, xl. 9, p. 7, 1939.

The Department of Agriculture of Victoria has issued the following modified spray programmes for the control of black spot [scab] of apples [*Venturia inaequalis*: *R.A.M.*, xvi, p. 187] and pears [*V. pirina*: ibid., xviii, p. 744]. Schedule 1 is recommended for apple varieties liable to russet, such as Jonathan, London Pippin, Yates, Rokewood, and Gravenstein: Bordeaux mixture 6–4–40 at the green tip stage (slightly earlier for Jonathan), lime-sulphur 2¼–80 at the '5 to 10 per cent. blossom' stage, 1½–80 at petal fall, and 1–80 a fortnight later. Schedule 2, recommended only for apple varieties which do not russet easily: Bordeaux mixture 6–4–40 at the green tip stage, 3–3–50 at the 'finger' stage (blossom buds beginning to separate) but not later. If late summer scab appears, 6 oz. each of copper sulphate and freshly slaked lime should be included in each 80 gals. of lead arsenate or white oil sprays, or lime-sulphur, if preferred, should be used at a strength of 1–80.

Recommendations for the control of scab on various pear varieties are as follows: for Williams, Beurré Bosc, Winter Nelis, and Madame Cole, Bordeaux mixture 6–4–40 at the delayed green tip and finger stages, and 3–3–50 with lead arsenate at the late calyx stage, but for the two last-named varieties the second spray must be completed before any petals show pink, and the third must not be applied within three weeks after petal fall; for Josephine and Winter Cole Bordeaux mixture 6–4–40 at the early green tip stage only; and for Packham's [Triumph] and other clean-skinned varieties Bordeaux mixture 6–4–40 at the delayed green tip and finger stages, and 1–1–50 (with lead arsenate) at the late calyx stage. Should summer scab appear, Bordeaux mixture 1–1–50 can be applied to Williams, Beurré Bosc, and Packham's Triumph; for Josephine 6 oz. each of copper sulphate and slaked lime can be added to each 80 gals. of lead arsenate sprays.

Rosella (E.). **La lutte contre les ennemis des arbres fruitiers.** [The campaign against fruit tree pests.]—*Vie agric. rur.*, xxix, 9, pp. 377–381, 1939.

Apricots and peaches are stated to have been severely attacked in France during the damp season of 1939 by *Coryneum* [*beijerinckii*: *Clasterosporium carpophilum*: *R.A.M.*, xii, p. 301], causing severe

gummosis and subsequent desiccation of the twigs, for the control of which dormant treatments of 2–2–100 Bordeaux mixture are recommended for both fruits, supplemented by summer sprays of copper oxychloride (200 to 300 gm. per 100 l. for peaches and 500 for apricots, the latter also responding favourably to 1–1–100 Bordeaux mixture). *Monilia* [*Sclerotinia fructigena* and *S. laxa*] (particularly injurious to apricots, though also attacking peaches and other stone fruits) [ibid., xvi, p. 389] may likewise be combated by copper-containing sprays applied (a) just before the renewal of growth, (b) immediately prior to the opening of the flower buds, and (c) after blossoming.

For joint control of apple or pear scab [*Venturia inaequalis* and *V. pirina*] and *Carpocapsa* [*pomonella*] the writer advocates two applications of 1–1½–100 Bordeaux mixture (or ¾–1to1½–100 for apple varieties susceptible to russeting) mixed with 500 to 1,000 gm. lead arsenate and 1 l. skimmed milk or ¾ to 1 l. white oil per 100 l. mixture, the first to be given at or shortly after the blossom and the second at the end of May in the south, beginning of June in the Paris region, and end of June in the central plains, the latter treatment being the more important. Copper oxychloride (500 gm. per 100 l.) may be substituted for Bordeaux mixture if desired.

Smith (W. H.). **Physiological breakdown in stored Monarch Plums.**—*J. Pomol.*, xvii, 3, pp. 284–291, 3 graphs, 1939.

Plums of the variety Monarch, stored at East Malling, Kent, at temperatures from 31° to 65° F. and for periods varying from 7 to 64 days, developed the minimum percentage of physiological breakdown [*R.A.M.*, xvii, p. 469] at 34°, a rapid rise taking place both above and below this temperature. The maximum percentage of breakdown after 14 to 21 days of storage occurred at intermediate temperatures, but after longer periods the maxima occurred at progressively lower ones. The effect of a greater degree of maturity at picking was to advance the time of the first appearance and maximum development of breakdown at each of the temperatures tested. The disorder appeared either as jellying, which was found only in plums stored at 37° or above, or as internal browning occurring in those stored at 31° and 34°. In plums disposed to jellying the flesh becomes relatively dry and mealy during the softening process, this condition being sometimes limited to a portion of the flesh, which becomes dark and injected. In advanced stages of jellying a ring of whitish, spongy tissue, in which numerous gas bubbles are present, frequently develops round the stone. Internal browning first appears as brown flecks radiating outwards from the stone; later the vascular strands become discoloured and browning becomes general, although frequently a ring of comparatively sound tissue is found beneath the skin. It is suggested that these are two distinct types of injury with probably different causal relations.

Arruda (S. C.). **'Mal do Panama' en 'Bernardino de Campos'.** [Panama disease in Bernardino de Campos.]—*Biologico*, v, 9, pp. 198–199, 1939.

Attention is drawn to the occurrence in Bernardino de Campos, Brazil, of Panama disease of bananas (*Fusarium oxysporum cubense*),

which has already decimated the extensive plantings in the municipality of Piracicaba (São Paulo) [*R.A.M.*, xvii, p. 50]. The symptoms of the disease are briefly described and control measures indicated.

MAGEE (C. J.). **Improved control methods for squirter and black end.**—*Agric. Gaz. N.S.W.*, l, 10, p. 564, 1939.

Experimental evidence has shown that a slight improvement in the case-dip method of controlling banana squirter disease [*Nigrospora sphaerica*: *R.A.M.*, xviii, p. 327] and black end [*Gloeosporium musarum* and *Fusarium* spp.: loc. cit.] may be effected by substituting the soluble powder, shirlan W.S., for shirlan A.G. The former leaves no deposit. It costs 9*s.* 6*d.* per lb. in New South Wales, as against only 4*s.* 6*d.* per lb. for shirlan A.G., but ½ lb. suffices for 30 gals. of dipping solution as against 1½ lb. of shirlan A.G. To render shirlan W.S. suitable for dipping bananas, a wetting agent, such as agral 2 (2 oz. per ½ lb. shirlan W.S., cost about 6*d.*), should be added. The cost of materials for treating 40 cases with shirlan W.S. squirter dip works out at 5*s.* 3*d.* as against 6*s.* 9*d.* for shirlan A.G. Any grower who has ever had a complaint about either disease in his consignments should adopt dipping as a routine procedure during the colder months of the year.

MAGEE (C. J.). **Control of Banana leaf spot and related diseases.**—*Banana Bull., Sydney*, i, 40, pp. 11–12, 1939.

Further investigations on the possibilities of controlling banana leaf spot (*Cercospora*) [*musae*] by the application of fungicidal sprays in the Tweed and Brunswick districts of New South Wales [*R.A.M.*, xviii, p. 264] have led to the development of a programme involving monthly treatments from December to April with cuprous oxide or copper oxychloride, both of which are equally effective with, and more convenient than, Bordeaux mixture. From 70 to 100 gals. per acre will be required for each treatment, and in most plantations on steep hillsides the most practical method of application will be by means of a bucket pump feeding two 30 ft. lengths of ¼ in. pressure hose, the estimated total cost of a treatment being reckoned at 25*s.* to 35*s.* per acre. Good control may also be obtained by thorough coverage of the plants with basic copper sulphate dusts.

MAGEE (C. J.). **Control measures outlined. Leaf spot and speckle in Bananas.**—*Banana Bull., Sydney*, i, 41, pp. 3, 13, 1 fig., 1939.

Following a recent survey of the banana plantations in the Tweed district of New South Wales, the writer briefly describes the symptoms and modes of infection of leaf spot (*Cercospora musae*) [see preceding abstract] and speckle [ibid., xiv, p. 216] (believed to be due to red spider [*Tetranychus telarius*]) and outlines the following programme for their control. At monthly intervals from December to April all plants expected to bunch from January to May should be sprayed with a suspension of copper oxychloride (1½ lb. to 40 gals.) and colloidal sulphur (1 lb. in 40 gals.). The March and April treatments should include plants which will bunch during June, July, and August. The spray should be applied to the under side of the two youngest leaves and to the heart leaf, taking care that the pipe or funnel leaf is reached.

Bordeaux mixture (1–1–10) may be substituted for copper oxychloride in plantations where its preparation presents no difficulties. Alternatively, the plants may be dusted with a mixture of 20 per cent. basic copper sulphate and 40 per cent. sulphur, or with a cheaper home-made preparation of 7 lb. basic copper sulphate or copper oxychloride and 14 lb. each of fine sulphur and superfine hydrate of lime.

Darrow (G. M.) & Waldo (G. F.). **Strawberry varieties in the United States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1043, 29 pp., 6 figs., 4 maps, 1939.

This bulletin (a revised edition of one originally prepared by the first-named author in 1919) contains notes on varietal resistance to disease and 'running-out' of strawberries in the United States. More or less satisfactory resistance to grey mould (*Botrytis*) [*cinerea*] is shown by the Sample, Chesapeake, and Aroma varieties. Leaf spots [*Mycosphaerella fragariae* and other fungi: *R.A.M.*, xviii, p. 402], which are stated to be specially destructive in the south, do not appreciably affect Chesapeake, Howard 17, Blakemore, Fairfax, Dorsett, Catskill, and Rockhill. Mildew [*Sphaerotheca humuli*] is occasionally troublesome on Late Stevens, Gandy, and Clark, but generally speaking is of no great importance on the commercial varieties in common cultivation. Marshall has been largely replaced in California by Nick Ohmer owing to the resistance of the latter to yellows [xanthosis: loc. cit.]. Aberdeen is immune from, and Pathfinder, Mastodon, and Redheart resistant to, 'red stele' root rot [*Phytophthora*: ibid., xviii, p. 123]. In nearly all sections fungal rots have played a prominent part in 'running-out', while virus diseases are also implicated on the Pacific coast and possibly in the eastern States.

Nattrass (R. M.). **A preliminary note on the 'woodiness' disease of Passion Fruit in Kenya.**—*E. Afr. agric. J.*, v, 2, pp. 130–133, 1939.

In the Trans Nzoia district of Kenya the woodiness disease of passion fruit recorded in 1936 [*R.A.M.*, xvi, p. 796; xviii, pp. 727, 748] has now assumed alarming proportions. Locally the fruit symptoms vary considerably, being influenced by the stage of development reached when the disease takes effect, the environmental conditions, and, apparently, the strain of the virus involved, but typically affected fruits are misshapen and show a thickened woody pericarp and a reduced pulp cavity. The foliage symptoms vary so widely that identical symptoms are seldom seen in different plantations.

Direct measures of control recommended consist in planting healthy material, destroying diseased plants, and the avoidance of passing on the disease during handling and pruning. Planting material should be raised from seed on the farm as far away as possible from other passion fruit. The nursery must be frequently inspected, and no plants should be used from any nursery once it has become affected. The successful eradication of diseased plants largely depends on the recognition of the disease in its earliest stages. The first diagnostic symptoms appear on the youngest foliage before the fruit is affected. Diseased plants should be cut off at ground-level and immediately burnt or scorched on the spot. Where the disease is known to occur, the leaders should be

stopped before meeting along the wires. Gaps may be replanted only when it is certain that the disease has been successfully eradicated from the plantation and no cases have occurred within three months.

Taylor (G. G.). **Application of orchard sprays.**—*Bull. N.Z. Dep. sci. industr. Res.* 23, 46 pp., 29 figs., 20 graphs, 1939.

The papers composing the four parts of the present bulletin and dealing, respectively, with the stationary spray system, the portable system, spray nozzles, and spray coverage have already been noticed from another source [*R.A.M.*, xvi, p. 824].

Trinchieri (G.). **Pour l'établissement d'une liste internationale de préparations antiparasitaires agricoles d'une efficacité reconnue.** [For the establishment of an international list of agricultural antiparasitic preparations of recognized efficacy.]—*Chron. bot.*, v, 4–6, pp. 428–429, 1939.

The views expressed in this paper have already been noticed from another source [*R.A.M.*, xviii, p. 506].

Atti e Communicazioni IV Congresso internazionale di Patologia comparata, Roma, 1939. [Proceedings and communications of the Fourth International Congress of Comparative Pathology, Rome, 1939.]—455 pp., 36 pl., 6 figs., 7 graphs, 2 maps, 1939.

The following papers occur in this report.

C. Sempio (pp. 355–366), writing on the problem of resistance in plant pathology (Aspetti del problema della resistenza in patologia vegetale), distinguishes between two forms of active protoplasmic resistance in higher plants to bacterial and fungal attack. One is toxicological, and results from the presence in the tissues of regressive products and, particularly, of specific toxins, elaborated or absorbed by the plant, while the other is metabolic, and consists in an acceleration or retardation of metabolism, resulting in the soluble components of the protoplasm being rendered less attractive to the parasite, which becomes weakened through lack of food.

When Frassineto wheat seedlings were grown in a nutrient solution containing cadmium nitrate, or in a nutrient solution and cadmium nitrate alternately, and were inoculated with a conidial suspension of *Erysiphe graminis*, the epidermal cells developed strong resistance to the penetration and development of the fungus, as compared with the untreated, inoculated controls, this effect being shown to a varying though less extent by other wheat varieties.

In experiments on metabolic resistance inoculated seedlings of the same varieties were exposed continuously to light for a period of nine to ten days immediately following inoculation, and the protective effect of the light against infection (as compared with plants kept in darkness for all or part of the same period) was most marked during what the author terms the first period of infection [*R.A.M.*, xviii, p. 471]. There was no appreciable difference in this respect between the varieties. As conidial germination was unaffected by exposure of the plants to light, the increased resistance is attributed to a continuous process of synthesis. Both the plants receiving cadmium and those exposed

continuously to light showed the presence in the epidermal cells of characteristic granulations.

V. Rivera (pp. 369–371) discusses the arrest or slowing down of metabolism as a necessary predisposing factor in infection. Experimental infections with Erysiphaceae showed that epidemics do not develop if the host cells are in a state of maximum turgidity; if this turgidity is artificially reduced, even to a slight extent, for example by suspending irrigation or putting in the sun plants grown in the shade, then intense infection will develop. In general, environmental conditions predisposing the host plant to infection are contrary to those which favour the development of the parasite, and vice versa.

The same author (p. 372) also briefly refers to the present state of knowledge concerning the action of metals at a distance on healthy and diseased plant tissues [ibid., xvi, p. 399].

Helena L. G. De Bruyn (pp. 373–374), in a note on marsh spot of pea seed as caused by manganese deficiency, gives a condensed account of work already noticed from another source [ibid., xviii, p. 777].

T. H. Thung (pp. 375–378) briefly discusses the possibility of immunizing tobacco and potato plants against virus diseases [ibid., xvi, p. 414], pointing out that the protective action of the virus of ordinary tobacco mosaic is stronger than that of most of the other sap-transmissible, thermostable viruses of tobacco, but that it gives no protection against subsequent infection with insect-transmissible tobacco viruses. Neither does the presence of the latter afford protection against the former. Viruses conferring protection against insect-transmissible tobacco viruses have not yet been found.

The protective vaccination of potatoes has given promising results, but the method has certain dangers, i.e., infection may spread to other varieties in the vicinity, mild strains may mutate to more highly pathogenic ones, and the vaccinated plants may contract diseases due to other viruses, which, in combination with the virus already present, may produce serious infection.

J. Dufrénoy (pp. 379–381, 4 figs.) states that the brown or black discoloration in the tissues of plants affected by virus diseases may be due to the formation of melanin or related materials from catechol or other diphenols, such as tyrosine derivates, by the agency of oxidases. The discoloration may be recognized by a change in the chloroplasts, which swell and finally develop into a brown mass.

Dufrénoy, H. S. Reed, and Sempio, discussing lipid degenerescence in plant cells (pp. 383–384), state that the complex lipid inclusions in plant cells of living tissues can be stained orange-red by immersion in a solution of sudan III. In healthy cells the lipids are arranged as small drops in the cytoplasm, but in the presence of pathological influences they become aggregated.

Investigations over several years at Wageningen, Holland, by H. M. Quanjer and his students (pp. 385–387) on the effect of different viruses and soil deficiencies on the health of potato plants [ibid., xviii, p. 545] have shown that each individual virus and each specific deficiency of an element causes particular external and internal symptoms. The characteristics of six virus and ten deficiency diseases are tabulated. Each virus interferes with a particular function, and each element plays

a specific part in the physiological activity of the plant. Of the deficiency diseases, those due to lack of nitrogen, potassium, phosphorus, calcium, magnesium, manganese, iron, and boron are said to occur in slight intensity in ordinary potato fields; those due to copper and zinc have so far only been produced experimentally.

Crafts (A. S.). **Movements of viruses, auxins, and chemical indicators in plants.**—*Bot. Rev.*, v, 9, pp. 471–504, 1939.

This is a fully documented review of the available knowledge of the subject.

Melhus (I. E.) & Kent (G. C.). **Elements of plant pathology.**—x+493 pp., 259 figs., New York, The Macmillan Company, 1939. 21*s.* net.

In this elementary text-book the main emphasis has been placed on the phenomena of parasitism in disease processes and the mycological aspects have been minimized. The first seven chapters are devoted to matters of general interest and are followed by nine chapters dealing separately with about 60 diseases due to fungi, bacteria, viruses, or other agencies, essential information on the occurrence, symptoms, cause, and control being given for each disease treated. The book is well illustrated and forms an excellent introduction to the subject of plant pathology.

Vereşceaghin (B. V.). **Patologie vegetala. Protecţia plantelor agricole.** [Plant pathology. Protection of crop plants.]—210 pp., 49 figs., Chişinău, Tipografia 'Tiparul moldovenesc', 1939. 90 lei.

In the part of this Rumanian text-book dealing with plant diseases (pp. 138–202) brief descriptions are given on the diseases of the more important crops with notes on their control.

Ramsey (G. B.). **Fruit and vegetable diseases on the Chicago market in 1938.**—*Plant Dis. Reptr, Suppl.* 114, 40 pp., 1939. [Mimeographed.]

Brief notes are given on the fungal, bacterial, virus, and physiological diseases of fruit and vegetables observed in the Chicago market in 1938 [*R.A.M.*, xviii, p. 35], and some data are added on the field and market diseases of Californian tomatoes.

Cook (M. T.). **Enfermedades de las plantas economicas de las Antillas.** [Diseases of economic crops in the Antilles.]—*Monogr. Univ. Puerto Rico*, Sér. B., 4, 530 pp., 1 pl., 171 figs., 1939. $2.00. [Obtainable from the Book Store, University of Puerto Rico, Rio Piedras, Puerto Rico.]

This is a useful text-book on diseases of cultivated plants in the Antilles. Following an introductory section, the author deals with the diseases of sugar-cane (138 pp.), citrus (64 pp.), banana (38 pp.), cacao (16 pp.), and a large number of other hosts, descriptions being given of the symptoms, the causal agents, and the methods of control for the more important pathogens. A glossary of 19 pp. is appended.

Wean (R. E.) & Young (J. E.). **Renewed liquid-cultures of fungi.**—*Phytopathology*, xxix, 10, pp. 895–898, 1 diag., 1 graph, 1939.

The writers describe the construction and application of an apparatus

for the automatic regulation of the renewal of liquid nutrient medium from a 6 l. Pyrex flask reservoir by siphoning into a series of flask cultures. The apparatus is of value in physiological studies on fungus growth.

CAPPELLETTI (C.). **Il ricambio dell' azoto in Corticium catonii Burg.** [The nitrogen exchange in *Corticium catonii* Burg.]—*Nuovo G. bot. ital.*, N.S., xlvi, 3, pp. 510–519, 1939.

The author states that experiments carried out by him showed that under the given conditions the orchid symbiont, *Corticium catonii* [*R.A.M.*, xi, p. 317], was unable to fix atmospheric nitrogen; on the contrary, when growing on nitrogenous media, especially nitric nitrogen, it released nitrogen.

SALAMAN (R. N.). **Potatoes: a retrospect. 1918–1938.**—*J. nat. Inst. agric. Bot.*, iv, 4, pp. 422–432, 1939.

In an address delivered at the Seventeenth Annual General Meeting of Fellows of the National Institute of Agricultural Botany at Cambridge in 1938 the author reviews the work done by the Institute during the years 1918 to 1938 in connexion with potato diseases. It is stated that in most years from 30 to 50 per cent. of the potato crop of England is severely infected with virus diseases, the losses amounting to at least 1,000,000 tons a year [*R.A.M.*, xvi, p. 770]. None of the existing potato varieties is immune from, or even fairly tolerant of, the virus of leaf roll, although Great Scot and Up-to-Date are more resistant than others; and none is immune from leaf drop streak (virus Y), although a varying degree of susceptibility is exhibited, and Ulster Monarch and Edgecote Purple are almost tolerant [ibid., xviii, p. 132]. There is no hope at present of breeding a variety immune from virus Y, and the key to the problem of control lies, therefore, in the use of clean seed. The author emphasizes the importance of introducing into the breeding stocks blood from wild and even unrelated tuber-bearing species of *Solanum* [ibid., xvii, p. 200; xviii, p. 410]. He considers that the highest possible production of potatoes can only be obtained by the use of virus-free seed in large quantities, and by the use of varieties tolerant of virus infection and frost in the ware districts.

NOLL (A.). **Untersuchungen über die Biologie und Bekämpfung des Kartoffelschorfes (Actinomyces).** [Studies on the biology and control of Potato scab (*Actinomyces*).]—*Landw. Jb.*, lxxxix, 1, pp. 41–113, 2 figs., 1 graph, 1939.

This is an exhaustive, fully tabulated account of the writer's studies at the Landsberg (Warthe) Agricultural Experiment Station, Germany, in 1936–7, on various aspects of potato scab (*Actinomyces* spp., including *A. scabies*) [*R.A.M.*, xix, p. 42].

The differences between the excrescences characteristic of the various types of scab—shallow, deep, and pustular—were found to depend mainly on the amounts of dead adhering or detached parenchyma and of newly formed parenchyma tissue below the terminal layer of wound cork, and on the extent and nature of the fissure development induced by tension in the surrounding tissues.

Differences in varietal reaction to the disease were apparent even in the early stages of tuber growth and as a rule became even more marked as the season advanced, though a few instances of partial recovery were noted, especially in 1937. Among the more resistant varieties [ibid., xvii, p. 413, 483] in both years was v. Kameke 447/40 (shallow type of infection); in 1936 promising results were also obtained with v. Kameke 477/31, Weisses Rössl (shallow), Graf Dürkheim 152/29 (shallow to deep), and Nordost 19/2957 (shallow to pustular), and in 1937 with Frühauf (shallow), v. Moreau WBH 8 (? pustular), v. Kameke 469/02 (shallow), Juli (deep), and Speisegelb (pustular). The type of scab was observed to depend, not only on the variety, but on the place of origin, which tended to modify the natural reaction, and the stage of development of the tubers, those in the juvenile phase being almost exclusively affected by the shallow form. On the other hand, no correlation was apparent between scab types and soil or climatic conditions and the time of ripening.

The pre-eminent importance of soil infection, already emphasized by previous workers, was again conclusively demonstrated by the admixture with the soil of ground scab excrescences. In inoculation experiments on sterilized Rosafolia tubers with various *A.* species (including Wollenweber's *A. incanescens*, *A. tricolor*, and *A. intermedius* [ibid. i, p. 183; xi, p. 25]) and strains and bacteria, only the writer's 1a, isolated from several varieties, gave absolutely conclusive results; it is characterized by regular hyphae, 0·5 to 1 μ in diameter, a loose, yellowish-brown mycelium, and conidia 1·8 by 0·8 μ.

Protection of the tubers against scab infection was conferred by the closure of the lenticels through suberization, by suberization of the skin and of the surface of wound tissue, as well as by the absence of fissure formation. The incidence of infection was correlated with (1) planting time, later dates (from 18th May to 28th July) being more favourable to the health of the stand than earlier ones; (2) soil moisture; and (3) place of origin. On severely infested soil (loamy sand) the amount of infection was appreciably reduced by timely watering; on the same soil in the greenhouse the minimum, optimum, and maximum water contents for the development of the disease were shown to be 15, 20, and 35 per cent., respectively, no scab occurring at 40 per cent. Most of the 47 varieties showed differences in their reactions to scab correlated with their eight places of origin, Parnassia and Industrie being notable exceptions to this rule.

No influence on the degree of infection was exerted by the extent of intumescence formation on the tuber, growth rate of the tubers, the resumption of development after temporary cessation, or the hydrogen-ion concentration of the soil. Important factors in varietal reaction were the amount of infection on the underground stem, freedom from which was in general (but not consistently) correlated with soundness of the tubers; the anatomical structure of the lenticels, the 'protection' of which by cork cells and other means of excluding the pathogen is normally associated with resistance, e.g., in Erdgold, Ackersegen, Hindenburg, Edelragis, Jubel, Treff As, and Berlichingen; and the capacity for wound periderm formation, activity in this respect connoting susceptibility to scab.

KÖHLER (E.). **Über die X^E Gruppe des Kartoffel-X-Virus.** [On the X^E group of the Potato X virus.]—*Zbl. Bakt.*, Abt. 2, ci, 1–3, pp. 29–40, 7 figs., 1939.

This is an expanded version of the writer's studies at the Biological Institute, Dahlem, Berlin, a preliminary account of which has already appeared [*R.A.M.*, xviii, p. 409]. The present paper defines the position of various aberrant and derivative strains, isolated from inoculated tobacco leaves within the two categories X^E and X^N. To X^E (inactivated after ten minutes at 75° C.) belong Ers 25, Ers 34 (a feeble variant of the foregoing), Mix B (a powerful variant of Ers 25), Bm (a derivative of Mix B identical with Ers 25), Bs (another derivative of Mix B, stronger than Bm), and a necrotic strain Bf. X^N (inactivated at 68°) comprises most, or probably all, the other X strains investigated by the author, including those of the Cs type [ibid., xvii, p. 561; xviii, p. 543].

PEYRONEL (B.). **Alcune osservazioni e considerazioni sulla biologia di Hypochnus solani Prill. et Del. in rapporto all' importanza dei funghi per l'ecologia e la distribuzione geografica delle piante superiori.** [Some observations and considerations on the biology of *Hypochnus solani* Prill. & Del. in relation to the importance of fungi in the ecology and geographical distribution of the higher plants.]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 319–323, 1939.

Rhizoctonia [*Corticium*] *solani* was found causing root rot of *Thlaspi rotundifolium*, *Gypsophila repens*, and *Oxytropis foetida* in a garden situated in the Alps at an altitude of 2,200 m. [*R.A.M.*, xvii, p. 264] in which potatoes have never been planted. Infection was also found on a number of apparently healthy wild plants in the Alps and was observed severely affecting *Polygonum persicaria*. The author concludes that *C. solani* is probably part of what he regards as the 'normal (and particularly root-inhabiting) fungal flora'. This flora is of great importance in the ecology and geographical distribution of the higher plants.

BONDE (R.). **Comparative studies of the bacteria associated with Potato blackleg and seed-piece decay.**—*Phytopathology*, xxix, 10, pp. 831–851, 1939.

A considerable proportion of the 62 bacteria found associated with potato blackleg, seed-piece decay, and soft rot in Maine and South Carolina, besides showing strong mutual similarities and a capacity for causing both blackleg and soft rot, were indistinguishable from authentic cultures of *Erwinia carotovora* [*R.A.M.*, xviii, p. 412], which name the writer, in conformity with J. G. Leach, prefers to *E. phytophthora* [ibid., x, p. 125]. Physiologically the cultures were nearly alike except in their gas and indol production relationships, some from both States evolving no gas on dextrose, sucrose, or lactose, others producing it on all three sugars, and five on lactose and sucrose but not on dextrose; eleven (all of the blackleg and soft rot groups) yielded indol on the application of the Kováks test only. The separation and classification of the soft rot bacteria cannot therefore be satisfactorily effected by these criteria.

The isolates corresponding in morphological and physiological characters with *E. carotovora* varied greatly in their pathogenicity to potato. Organisms capable of causing seed-piece decay (a form of soft rot) were

secured from numerous sources, indicating that this type of infection is more liable to arise from contamination of the cut seed tubers than from diseased seed stock. *E. carotovora* was frequently detected in intimate contact with certain common insect occupants of rotting plant tissues, e.g., *Hylemyia* [*Phorbia*] *cilicrura*, *H.* [*P.*] *brassicae* (in the puparia of which it survived exposure to a severe northern Maine winter), and *Psila rosae*, while three Maine cultures were isolated from potato scab (*Actinomyces scabies*) lesions. Three other cultures of *E. carotovora* were isolated from the soil of the Charleston (South Carolina) truck crop area and four from that of a Maine potato field; one of the former gave rise to a non-chromogenic variant on potato slices and other media.

Certain plants yielding the blackleg pathogen manifested atypical symptoms, being very small (4 to 6 in. in height) with darkened, decayed stems, and developing early in the season when the cause of their condition may not be easily recognized. An apparently undescribed organism with long polar flagella was found to be the agent of a yellow or creamy rot of the seed pieces near Charleston. In Maine a similar yellow decay is caused by different organisms, while still other weakly parasitic bacteria appear to be responsible in the same State for a slow, white to brownish rot of potato seed pieces, as well as for rotting of common and Chinese cabbage, cauliflower, and turnip. Tubers affected by 'stem-end browning' and a discoloration of the vascular bundles yielded apparently related pathogenic bacteria.

Goss (R. W.) & Jensen (J. H.). **A survey of bacterial wilt and ring rot of Potatoes in Nebraska in the spring of 1939.**—*Plant Dis. Reptr*, xxiii, 17, pp. 288–290, 2 maps, 1939. [Mimeographed.]

In two surveys made in Nebraska in the early spring of 1939, 21 out of 215 stock lots of stored non-certified potatoes contained tubers infected by *Bacterium sepedonicum* [*R.A.M.*, xviii, p. 788], while out of 254 lots of Nebraska certified seed potatoes growing in a test plot six contained infected plants. In addition, five lots of seed tubers from other States were found infected. A map is given showing the distribution of the disease in the United States.

Murray (R. K. S.). **Report of the Botanist and Mycologist for 1938.**—*Rep. Rubb. Res. Bd, Ceylon, 1938*, pp. 29–50, 1939.

In this report [cf. *R.A.M.*, xvii, p. 770] it is stated that during February and March, 1938, the weather in most of the *Hevea* rubber-growing areas of Ceylon was exceptionally cool, dull, and wet; the maturation of the young leaves was delayed, and infection by *Oidium* [*heveae*: ibid., xviii, p. 816] became unusually severe. The control given by sulphur dusting was poor in most cases, as the dust was largely washed off the leaves, and the fungicidal efficiency of what remained was probably reduced by the absence of sun.

The apparent freedom of old rubber from root fungi (*Fomes lignosus*, *F. noxius*, and *Poria hypobrunnea*) [ibid., xviii, p. 655] is not evidence that the young plants will remain unaffected. For example, of two clearings in the same district, one may be entirely free from *F. lignosus* while the other is severely infected, though in both clearings the old

trees may have seemed healthy. In the uninfected clearing the preliminary removal of lateral roots would be uneconomic, whereas in the infected one any reasonable expenditure involved in the discovery and eradication of the infection centres would be justified. Replies to a questionnaire circulated among growers showed that the loss from root disease up to the end of 1937 was only 1,120, 74, and 51 trees killed by the three above-mentioned fungi, respectively, over 10,048 acres or about 0·1 per cent. There does not appear to be, therefore, any cause for serious apprehension. On 17 estates, however, representing 1,713 acres, there was a loss of 976 trees and one estate had over 498 cases of *F. lignosus* alone. Taking the average number of trees per acre as 120, the percentage loss was about 0·06 and 0·14 per cent., respectively, in certain areas where the lateral roots were and were not removed before replanting. The evidence showed that the affected plants generally occurred singly, that the source of infection was almost invariably an old rubber root, and that the practice of digging over infected areas and removing all roots in most cases gave effective control.

Helminthosporium heveae [loc. cit.] continued to give trouble in nurseries; in one test with several different fungicides only sulphur dust gave any appreciable control.

Waksman (S. A.) & Martin (J. P.). **The role of micro-organisms in the conservation of the soil.**—*Science*, N.S., xc, 2335, pp. 304–305, 1939.

In studies carried out in New Jersey to determine the extent of soil binding and aggregation induced by micro-organisms, artificial soils consisting of sterile sand-bentonite and sand-clay mixtures were adjusted to optimum moisture and inoculated with pure cultures of fungi and bacteria or with a soil infusion. Sucrose or cellulose were used as sources of energy, and nutrient salt solutions were added. After incubation for various periods, the contents of the flasks were analysed to show relative differences in binding effects.

The results obtained showed that, using sucrose as the source of energy, and *Rhizopus nigricans*, *Aspergillus niger*, *Azotobacter indicum*, *Bacterium* [*Pseudomonas*] *fluorescens*, and soil infusion for inocula, the bound material amounted to 3, 25, 26, 10, and 17 per cent., respectively, compared with 0 for the control in tests using the pipette method, and 36, 72, 60, 36, 45, and 0 per cent. with the slope method. Using cellulose, the corresponding figures were 18, 14, 21, 41, and 0 per cent. (pipette), and 26, 21, 26, 45, and 0 per cent. (slope).

These figures demonstrate that soil organisms exert an important binding effect, the degree of which depends on the organism concerned. Similar results were obtained with sand-clay mixtures. It is concluded that micro-organisms play a very important part in soil conservation, which is closely associated with the transformation of the organic matter added to the soil.

Rodighin (M. N.). Редкие и малоизвестные грибные болезни Сафлора в Поволжье. [Rare and little known fungous diseases of Safflower in the Volga region.]—'25 years Saratoff Agricultural Institute', Saratoff, pp. 186–190, 1939.

In this annotated list of fungous diseases of safflower (*Carthamus*

tinctorius) in the Volga region of the U.S.S.R., descriptive notes are given of the following parasitic species: *Aecidium* [*Puccinia*] *carthami* [*R.A.M.*, vi, p. 355], reported for the first time from the Soviet Union; *Phyllosticta carthami* described in 1934 by A. Tropova [cf. *P. carthami* Roldan, 1936: ibid., xvi, p. 209]; *Ascochyta carthami* [ibid., vii, p. 764]; *Septoria carthami* [ibid., xviii, p. 413]; *Ramularia carthami* [ibid., vii, p. 165]; *Cercosporella carthami* [ibid., vi, p. 355]; and *Macrosporium carthami* Rodighin n.sp. The last-named produces on the leaves reddish-yellow, later brown, spots which become covered on both sides with a dark, velvety growth of fasciculate conidiophores, 80 to 124 by 4 μ, bearing [ob-]clavate or fusoid, olivaceous conidia, with 6 to 12 transverse septa, 58 to 74 by 11 to 14 μ. In addition two new saprophytic species are described, viz., *Phoma carthami* and *Stagonospora carthamicola* from dried stems. All new species have Latin diagnoses.

Bureau of Sugar Experiment Stations. Gumming disease in the Hambledon area. Official notifications. Quarantine areas.—*Aust. Sug. J.*, xxxi, 6, pp. 334, 351, 1939.

The Director of the Bureau of Sugar Experiment Stations, Queensland, reports the development of an outbreak of gumming disease [*Bacterium vasculorum*], chiefly affecting the S.J. 4 sugar-cane variety [*R.A.M.*, xviii, pp. 619, 625] in the Hambledon Mill area in July, 1939. The planting of the variety in question will therefore in future be prohibited over the major part of the area, and growers are further reminded that Clark's Seedling and Gaspari will also be disallowed in 1941. The outbreak having occurred some miles north of the nearest known centre of infection in the Mulgrave area, the pathogen was evidently introduced with a consignment of diseased plants and not by natural means.

Details are given of the nature and extent of the quarantines imposed in the Moreton Mill District, Mapleton, and Isis Mill District Quarantine Areas of Queensland in respect of Fiji disease of sugar-cane [ibid., xviii, p. 760].

Hutchinson (S. A.). **Macroconidial formation in Ophiostoma majus (van Beyma) Goidànich.**—*Ann. Bot., Lond.*, N.S., iii, 12, pp. 795–802, 1 pl., 1939.

A detailed account is given of the formation of macroconidia by *Ophiostoma majus* [*R.A.M.*, xiv, p. 703]. The macroconidia arise endogenously by free cell division within the terminal cell of the conidiophore. The outer wall at the tip of the conidiophore dissolves and the protoplast, enclosed in a delicate inner wall, is extruded. The extruded portion rounds off to form the spore, which becomes invested by a thick wall. The inner wall of the conidiophore remains as a delicate sheath round the spore chain until maturity is reached.

Emendations to the second edition of the List of Common Names of British Plant Diseases (prepared by a Sub-committee of the British Mycological Society's Plant Pathology Committee and approved by that Committee).—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 273–280, 1939.

In this paper W. C. Moore, G. C. Ainsworth, E. W. Mason, and Miss

E. M. Wakefield set out certain necessary emendations to the second edition of the List of Common Names of British Plant Diseases [*R.A.M.*, xviii, p. 754].

The name *Bacillus* being no longer tenable for plant pathogens [ibid., xvi, p. 482; xviii, p. 658], *B. phytophthorus* (= *B. atrosepticus*) is changed to *Bacterium phytophthorum* or *Erwinia phytophthora*, *B. carotovorus* to *Bact. carotovorum* or *E. carotovora*, and *B. aroideae* to *Bact. aroideae* or *E. aroideae*. In conformity with Wollenweber and Reinking's 'Die Fusarien' (1935) [ibid., xiv, p. 708], *Fusarium avenaceum* supersedes *F. herbarum* var. *avenaceum*, *F. solani* var. *martii* is replaced by *F. solani* var. *martii* f. 3, *F. bulbigenum* by *F. bulbigenum* var. *lycopersici*, *F. lycopersici* Sacc. by *F. lycopersici* Brushi, and *F. lateritium* var. *fructigenum* by *F. lateritium*.

The original spelling '*levis*' in the name *Ustilago laevis* is retained. When the word means 'smooth' the usual botanical spelling is '*laevis*', to distinguish it from '*lĕvis*' (light in weight), and various writers have unjustifiably changed the original *U. levis* to *U. laevis*.

Puccinia lolii is discarded in place of *P. coronata* for the crown rust of oats, in view of the work of Miss Brown [ibid., xvii, p. 23].

For chocolate spot of beans, vetch, and sainfoin *Botrytis cinerea* is accepted as the pathogen in place of ? *Bacillus lathyri* in accordance with A. R. Wilson's findings [ibid., xvi, p. 722].

The authority for the name *Alternaria brassicae* is changed, according to Article 54 of the International Rules of Botanical Nomenclature [ibid., xvi, p. 482] from (Berk.) Bolle to (Berk.) Sacc. According to Bolle [ibid., iv, p. 60], Saccardo did not have Berkeley's species before him when he transferred *Macrosporium brassicae* Berk. to *Alternaria*, and Bolle therefore claimed to re-make the combination when she had what she thought was the correct species.

The authority for *Uromyces betae* is changed from (Pers.) Tul. to Lév. as Léveillé made the combination seven years before Tulasne, and Persoon's name only refers to the uredo stage and must not be cited.

The correct citation for *Rosellinia necatrix* is *R. necatrix* Prill., though *R. necatrix* Berl. in Prill. may be used.

In the case of aster wilt, *Fusarium* spp. is replaced by *F. conglutinans* var. *callistephi* [ibid., xviii, p. 336]. Ring spot of carnation and pink and leaf spot of sweet william are attributed to *Didymellina dianthi* since this ascigerous stage of *Heterosporium echinulatum* has now been found in Scotland [ibid., xvi, p. 255]. The whole entry for wilt and stem rot of carnation and pink is deleted and replaced by *Verticillium* wilt, *Fusarium* wilt, and stem rot which are given as *V. cinerescens*, *F. dianthi* and *F. culmorum*, and *Fusarium* spp., respectively [ibid., xv, p. 225]. The transference of *Diaporthe umbrina* to *Cryptosporella* as *C. umbrina* is recognized for the fungus causing brown canker of rose [ibid., xv, p. 155], and *Sclerotinia polyblastis* is accepted as the ascigerous stage of *Botrytis polyblastis* [see above p. 97], the cause of *Narcissus* fire. The spelling of *C[olletotrichum] linicolum* is changed to *C. linicola*.

Gibberella saubinetii is maintained for the well-known parasite of cereals, though Petch has claimed it as a synonym of *G. cyanogena* and maintains that the cereal fungus is really *G. zeae* (Schw.) Petch [ibid., xvi, p. 29], since 'for the time being it is considered desirable to retain

the widely used and familiar name'. *Urocystis* is used in preference to *Tuburcinia* pending the decision of the International Botanical Congress [ibid., xviii, p. 755]. *P. hordei* Otth (1871) is earlier than *P. hordei* Fuckel (1873) [ibid., xv, p. 209] and, if accepted, is the valid name for brown rust of barley. As, however, *P. hordei* is applied only to a yellow rust of barley, it has been decided not to use it, without consultation, as the accepted name for barley brown rust, but to regard it as a *nomen ambiguum*.

So far as is known, none of the 155 species compiled as *Cylindrosporium* in Saccardo's *Sylloge* is congeneric with *Gloeosporium concentricum* (Grev.) Berk. [ibid., xviii, p. 654], which is the type species of Greville's monotypic genus. In order to retain *C. concentricum* all the 155 species will require to be renamed and it is proposed, therefore, to continue the use of the name *G. concentricum* for the time being, but unless some action is taken to conserve the use of the name *Cylindrosporium* in a different sense from that of Greville, it will not be correct to do so indefinitely.

WAKEFIELD (E[LSIE] M.). **Nomina generica conservanda. Contributions from the Nomenclature Committee of the British Mycological Society. II.**—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 281–292, 1939.

This further contribution [*R.A.M.*, xviii, p. 755] from the Nomenclature Committee of the British Mycological Society contains statements concerning thirteen more of the names proposed for conservation in the lists published as a supplement to the International Rules, 1935. The following genera, *inter alia*, are dealt with: *Peziza* Fr. (1822) versus *Aleuria* Fuckel (1869), *Coniothyrium* Sacc. (1880) versus *Clisosporium* Fr. (1832) and *Coniothyrium* Corda (1840), *Sphaeropsis* Sacc. (1880) versus *Sphaeropsis* Lév. (1842) and *Macroplodia* Westend. (1857), *Phoma* (Desm.) 1849 versus *Phoma* Fries (1823) and *Sphaeropsis* Lév. emend. O. Kuntze (1898), *Stagonospora* Sacc. (1884) versus *Hendersonia* Berk. (1841) and *Psilothecium* Fuckel (1865), *Hendersonia* Sacc. (1884) versus *Hendersonia* Berk. (1841) and *Sporocadus* Corda emend. O. Kuntze (1898), and *Marssonina* Magnus (1906) versus *Marssonia* Fischer (1874) non Karst. (1858) and *Marsonia* Sacc. (1880).

PEREIRA DE MELO (P. P.). **O 'saporema' de Pernambuco.** [The 'saporema' of Pernambuco.]—*Bol. Agric., Pernambuco*, iv, 2, pp. 127–129, 3 pl., 1939.

No indication of pathogenicity of the 'saporema' fungus, considered by B. Pickel to be an undescribed species of *Polyporus* which he terms *P. pseudosaporema* n.sp. [without a diagnosis], has so far been obtained in experimental plots of sugar-cane and cassava inoculated by interplanting with sclerotia of the fungus in Pernambuco, Brazil [*R.A.M.*, xvii, p. 191].

CHRISTOFF (A.). Корекции и бележки върху паразитната флора на България. [Revision and notes on the parasitic flora of Bulgaria.] —*J. agric. Exp. Stas Bulgaria*, ix, 2, pp. 77–85, 1939. [English summary.]

This list of parasitic diseases of plants in Bulgaria is supplementary

to that compiled by D. Atanasoff and D. Petroff in 1930 [*R.A.M.*, x, p. 210] and is based on hitherto unpublished records or unidentified herbarium material. The following may be mentioned among the 35 species recorded: *Phytomonas* [*Bacterium*] *holci* [ibid., xiv, p. 16; xviii, p. 517] on *Andropogon halepensis* [*Sorghum halepense*], *P. tabacae* [*Bact. tabacum*] on tobacco, *Septoria cannabis* on hemp [ibid., xvi, p. 749], *S. mahoniae* on barberry, *Rhynchosporium secalis* on two-rowed barley [ibid., xvii, pp. 233, 654], *Gymnosporangium juniperinum* [ibid., xvi, p. 562] on apple, *Ustilago ficuum* on fig, *Hendersonia conorum* on pine (*Pinus sylvestris*) needles, *Septoria ampelina* on the vine [ibid., xvii, p. 95], and *S. graminum* [ibid., xviii, p. 297] on wheat. In addition 48 species have been found to be wrongly determined and are corrected, the following rectifications being of interest: *Phytomonas* [*Bact.*] *mori* on *Morus* sp. has been incorrectly identified in the past as *Coniothyrium foedans*, *Uromyces appendiculatus* on beans (*Phaseolus vulgaris*) as *U. phaseolorum*, *U. fabae* on lentils [ibid., xvii, p. 220] as *U. viciae fabae* on broad beans, and *Septoria rubi* [ibid., xvii, p. 190] on raspberry as *Phyllosticta ruborum*.

Moesz (G.). **Fungi Hungariae. III. Ascomycetes. Pars 1.** [Fungi of Hungary. III. Ascomycetes. Part 1.]—*Ann. hist.-nat. Mus. hung.*, Pars. bot., xxxii, pp. 1–61, 1939. [Hungarian and German.]

This is a critically annotated list, supplemented by a bibliography of 62 titles, of 120 Ascomycetes, mostly Erysiphaceae (65 species), Exoascaceae (20), and Elaphomycetaceae (13), collected in Hungary [cf. *R.A.M.*, xvii, p. 139].

Imazeki (R.). **Observations on Japanese fungi. II.**—*Jap. J. Bot.*, xv, 7, pp. 440–449, 7 figs., 1939. [Japanese, with English summary.]

Descriptive notes are given on the following fungi found on dead tree trunks in Japan: *Polyporus squalens*, *P. guttulatus*, *P. montanus*, *Trametes subrosea* [*R.A.M.*, ix, p. 80; xiv, p. 795], *T. malicola*, and *T. flavescens*.

Hilborn (M. T.) & Steinmetz (F. H.). **1937 and 1938 additions and corrections to the list of causes of fungous and bacterial plant diseases in Maine.**—*Plant Dis. Reptr, Suppl.* 113, pp. 21–26, 1939. [Mimeographed.]

This supplementary list of plant diseases found in Maine [*R.A.M.*, xvii, p. 773] comprises 115 pathogens and 55 hosts.

Gäumann (E.). **Zur Kenntnis einiger Carex-Puccinien.** [A contribution to the knowledge of some species of *Puccinia* on *Carex*.]—*Zbl. Bakt.*, Abt. 2, c, 24–26, pp. 483–500, 5 graphs, 1939.

Descriptions are given [in German and Latin] of five new species of *Puccinia* collected in the teleutospore phase on *Carex* in Switzerland, including *P. ribesii-diversicoloris* on *C. diversicolor* and *P. mayoriana* on *C. digitata*, both belonging to the collective species *P. ribesii-caricis* (*P. pringsheimiana*) [*R.A.M.*, xiii, p. 173; xvii, p. 704] and forming their aecidial stages on gooseberry and *Ribes alpinum* leaves; and *P. leucanthemi-vernae* (collective species *P. aecidii leucanthemi*) on *C. verna* and

C. ericetorum, the aecidial stage of which develops on *Chrysanthemum leucanthemi-vernae*.

ZUNDEL (G. L.). **Studies on the Ustilaginales of the world.**—*Mycologia*, xxxi, 5, pp. 572–589, 3 figs., 1939.

Among the species given in this annotated list of smuts from various countries the following are worthy of mention. *Ustilago cynodontis*, *U. dregeana*, and *U. paraguariensis*, which have in the past been confused with each other, were studied on the basis of original collections and found to be distinct species, differing clearly in the size and appearance of their spores. All three were reported on *Cynodon dactylon*, but the author demonstrates that *U. dregeana* has been attributed to this host by mistake probably for *Eragrostis porosa*.

A new genus, *Xylosorium*, with the type species *X. piperii* on *Piper* spp., is reported from South Africa, and *Sphacelotheca papuae* n.sp. found on *Saccharum arundinacea* from British New Guinea. Lists are also given of six species from Colombia, thirteen from Minas Geraes, Brazil, and six (two new) from the Clinton collection of smuts from south-eastern Asia. English and Latin diagnoses are given of the new genus and new species.

ZUNDEL (G. L. I.). **Additions and corrections to Ustilaginales.**—*N. Amer. Flora*, vii, 14, pp. 971–1030, 1939.

This contribution to the North American Flora adds nearly 80 species [including 13 new species for which Latin diagnoses are given] and numerous host records to Clinton's account of the Ustilaginales of North America (*N. Amer. Flora*, vii, 1, pp. 1–82, 1906). Revised keys to the species of the larger genera are given in full.

BARNHART (J. H.). **Revised host-index to the Ustilaginales.**—*N. Amer. Flora*, vii, 14, pp. 1031–1045, 1939.

This host index combines the original one (*N. Amer. Flor.*, vii, 1, pp. 73–82, 1906) and the additions and corrections given in the preceding paper.

GADD (C. H.). **A virus disease of Tea.**—*Tea Quart.*, xii, 3, pp. 110–116, 2 figs., 1939.

In this address to tea planters in Ceylon, the author states that phloem necrosis [*R.A.M.*, xviii, p. 713], now regarded as due to a virus, has spread extensively through the tea-growing parts of the island. It has been observed on 51 estates, and the evidence suggests that every estate situated at an altitude of more than 4,000 ft. may be harbouring the disease to some extent. In some fields 50 per cent. of the bushes are affected. All unproductive bushes showing the backward curl of the leaves characteristic of the condition should be removed, the vacant sites again being planted to tea immediately, if desired.

In the discussions that followed (pp. 116–130) the author, in commenting on the increased yield obtained by one grower from a field of necrotic tea (viz., 1,547, 1,570, 1,634, and 1,866 lb. per acre, respectively, in three-yearly periods between 1926 and 1938), agreed that crop returns give small indication of the disease in its initial stages; in some instances,

even advanced stages may not lead to any marked drop in yield. On the other hand, he had observed one field in which a progressive and marked reduction in yield was definitely due to phloem necrosis. The removal of badly necrosed bushes in large numbers may at first have only a negligible effect on yield. The lowest elevation at which the disease has been found is 3,400 ft.; at the lower altitudes the symptoms become more difficult to recognize than at the higher elevations. The condition is most easily recognized in fields 'coming back' from pruning, about tipping time. It occurs most frequently in fields of the hybrid type, but certainly attacks bushes of good jât also. As high jât is distinguished from low jât mainly by leaf size, necrotic bushes necessarily appear lower in jât than they really are. Pruning cuts experimentally exposed to contact with juice from infected plants failed to develop infection. In conclusion, the author expressed his inability to recognize the earliest stages of infection, and stated that in one experiment twelve months elapsed before he could be certain that transmission had been effected.

Park (M.) & Fernando (M.). **A convenient method of determining the incubation period of a plant pathogen in the field.**—*Trop. Agriculturist*, xciii, 4, pp. 213–214, 1 graph, 1939.

A technique developed in Ceylon in connexion with tobacco frog eye [*Cercospora nicotianae*: *R.A.M.*, xvii, p. 755] is described for estimating the incubation period of the pathogen in the field. In a tobacco crop approaching maturity large numbers of conidia are deposited on the leaves every day and new infections develop continuously. A curve of the number of lesions developing on such leaves plotted against time will accordingly exhibit an uninterrupted rise. When, however, leaves are sprayed with a fungicide, all conidia falling on the leaf after spraying will be killed, and the symptom curve will show a rise for a period not exceeding the incubation period of the fungus, after which it will abruptly flatten out. The interval between the date of spraying and this abrupt flattening of the curve will consequently provide an estimate of the incubation period. The fungicidal cover, however, is rarely completely effective, and occasional infections may arise even after spraying. The latter part of the curve, therefore, will not always be quite horizontal. Records of lesion numbers made during 1938-9 in Ganewatta showed the incubation period of *C. nicotianae* to last from five to eight days. The method is probably applicable to other diseases amenable to control by spraying.

Okuda (Y.) & Katai (K.). **Biochemistry of mosaic disease of Tobacco. III. Catalase in the leaves of healthy and mosaic plants. IV** (with T. Hibi). **Oxidase, peroxidase, and amylase in the leaves of healthy and mosaic plants. V. Ascorbic acid contents in the leaves of the healthy and mosaic plants.**—*J. agric. chem. Soc. Japan*, xiv, pp. 1264–1270, 1386–1394, 1938; xv, pp. 80–86, 1939. [Abs. in *Chem. Abstr.*, xxxiii, 21, p. 8690, 1939.]

The iodine method of determining the relative catalase contents of healthy and mosaic tobacco foliage [*R.A.M.*, xviii, p. 415] was found to be the most effective of those tested. Catalase activity in both leaf

groups reached an optimum at P_H 7 to 7·5 and 15° C. The catalase content was higher in the upper than in the lower leaves and in sound than in diseased foliage.

Peroxidase activity was most marked in the healthy lower and diseased middle leaves, and generally stronger in mosaic than in sound material. In stored leaves the peroxidase content rose slightly for four days and then gradually decreased. The optimum hydrogen-ion concentration and temperature for peroxidase activity were, respectively, P_H 6 to 6·5 and 60°. The action of oxidase was most powerful in the upper leaves and was, in general, stronger in mosaic than in healthy foliage. In storage the activity of oxidase attained a maximum after seven days and was most in evidence at P_H 7·3 and 60°. There was no difference between healthy and diseased leaves as regards the operation of amylase, the content of which was higher in the lower than in the upper foliage. The optimum hydrogen-ion concentration and temperature for amylase activity were, respectively, P_H 7 and 40°; glycerol exerted a retarding effect.

Using a new technique [which is described] for the estimation of ascorbic acid, it was found that this substance, especially in its reduced form, was richer in the upper than in the lower leaves. The ratio of reduced ascorbic acid to the total was 70 to 80 per cent. The ascorbic acid content of the sound foliage was slightly superior to that of the diseased leaves [cf. ibid., xvii, p. 266]. In stored leaves the reduced ascorbic acid fell to nil in a week, while the oxidized reached a maximum in five to six days.

Mandelson (L. F.) & Tommerup (E. C.). **Yellow patch of Tobacco seedlings.**—*Qd agric. J.*, lii, 3, pp. 280–294, 4 figs., 1 graph, 1939.

During the past four or five seasons tobacco seedlings in North Queensland have been affected by a condition referred to as 'yellow patch' or 'yellowing'. Seed germination is impaired, and the number of seedlings that emerge is greatly reduced. In some patches the cotyledons remain small, and when the true leaves develop the seedlings are stunted, pale green or yellow, and generally die, whereas neighbouring plants show normal growth. The affected patches do not enlarge, but new patches may develop in a bed later. Severity decreases in time, and as the soil is moistened and worked and after two or three attempts to establish a seed-bed, a satisfactory stand may be obtained after re-sowing, provided no additional fertilizer is applied.

Preliminary investigations indicated that the trouble was physiological and closely associated with the application of excessive quantities of organic nitrogen in mixed fertilizers to the seed-bed. It is probably caused by the accumulation of free ammonia in the soil. In further experiments, even 0·1 oz. nitrogen as dried blood per sq. yd. retarded growth, and when quantities over ½ oz. were used nearly all the seedlings succumbed. The condition did not appear where only nitrate of soda in various amounts was used as the source of nitrogen, and the use is recommended of a fertilizer mixture consisting of two parts nitrate of soda, four parts superphosphate, and one part sulphate of potash (by weight), applied at the rate of 1¾ oz. per sq. yd. of seed-bed. No yellow patch appeared in seed-beds treated with this mixture in 1938–9.

Smith (T. E.). **Host range studies with Bacterium solanacearum.**—*J. agric. Res.*, lix, 6, pp. 429–440, 5 figs., 1939.

In experiments carried out from 1935 to 1938, inclusive, to compare the susceptibility of numerous plants to natural and artificial infection by *Bacterium solanacearum*, the hosts were grown for one or more seasons in highly infested soil, cultivation with horse-drawn and hand implements facilitating natural infection following root injury. Each season every third or fifth row was planted with highly susceptible tobacco varieties. Counts were made of plants showing symptoms on the below-ground as well as on the above-ground parts, and in addition numerous observations were made on infested farms. Tests on artificial infection were made by inserting wedges of discoloured tissue from the woody cylinder of affected tobacco plants into the stems of the different hosts just below the terminal buds.

Twenty-nine species reacted positively to both natural and artificial infection. Of these tobacco, tomato, *Nicotiana rustica*, eggplant, *Datura stramonium*, *Solanum nigrum*, *Croton glandulosus*, *Bidens bipinnata*, *Xanthium pennsylvanicum*, nasturtium, potato, and *Eclipta alba* showed 71 to 100 per cent. natural infection; chilli, *Physalis pruinosa*, and sunflower 51 to 70 per cent.; beans (*Phaseolus vulgaris*), *Ambrosia elatior*, *Aster pilosus*, *Dahlia rosea*, *Ricinus communis*, *Tagetes erecta*, and *Petunia hybrida* 21 to 50 per cent.; and groundnut, *Leptilon canadense*, *Ambrosia trifida*, *S. carolinense*, *X. chinense*, *Verbena hybrida*, and *Cosmos bipinnatus* 1 to 20 per cent. On the less susceptible species root rot rather than foliar wilting was generally the predominant symptom.

Species consistently susceptible to artificial inoculation but apparently unaffected through the roots by the soil-borne parasite were cowpea, soy-bean, *Stizolobium deeringianum*, Lima bean (*Phaseolus lunatus*), and *Canna* sp. Cowpeas, soy-beans, and *S. deeringianum* remained unaffected, even under very severe conditions of natural infection, and the number of bacteria present in the tissues after artificial inoculation was ascertained to be very greatly inferior to the number present in naturally infected tobacco, the organism being unable to multiply rapidly in these three hosts. Twenty species of cultivated, and 36 species of wild, plants [which are listed] were unaffected by artificial or natural infection and are considered to be immune; of these, five have been listed by various workers as susceptible.

It is concluded that the following should be removed from the host list of *Bact. solanacearum*: sweet potato, cotton, watermelon, fireweed (*Erechtites hieracifolia*), *Crotalaria striata*, *S. deeringianum*, *P. lunatus*, soy-bean, and cowpea, and that *X. pennsylvanicum*, *X. chinense*, *Physalis pruinosa*, *Aster pilosus*, and *Ambrosia trifida* should be added to it.

Valleau (W. D.), Diachun (S.), & Johnson (E. M.). **Injury to Tobacco leaves by water-soaking.**—*Phytopathology*, xxix, 10, pp. 884–890, 3 figs., 1939.

Observations on White Burley Kentucky No. 16 tobacco leaves subjected to artificial water-soaking by means of a specially devised spray nozzle apparatus connected by a pipe with a garden hose showed that

extensive injury is liable to result after periods of 24 to 72 hours, or within the next few days, quite independent of infection by *Bacterium tabacum* or *Bact. angulatum* [*R.A.M.*, xvii, p. 205]. The inoculation of water-soaked tissues with these organisms enhances the already existing injury but does not induce the typical field symptoms of wildfire. Water-soaking, therefore, is considered to play only a minor part, if any, in the development of wildfire epidemics on maturing dark tobacco in Kentucky.

Haddow (W. R.) & Adamson (M. A.). **Note on the occurrence of needle blight and late fall browning in Red Pine (Pinus resinosa Ait.).**—*Forest. Chron.*, xv, 2, pp. 107–110, 1 pl., 1939. [Abs. in *Biol. Abstr.*, xiii, 9, p. 1582, 1939.]

In several localities of Simcoe and Durham Counties, Ontario, young, densely planted red pine (*Pinus resinosa*) trees have been affected since 1932 by a summer blight and autumn browning of the current season's foliage. Both forms of the disease appear to originate in the oviposition of a gall midge (Cecidomyidae) at the needle bases. If the needles thus injured contract infection by *Pullularia pullulans* in the growing stage, blight develops; otherwise the midge larvae induce browning on reaching maturity in the autumn. Hitherto no trees have been killed by the disease.

Present status of the Dutch Elm disease.—*Plant Dis. Reptr*, xxiii, 17, pp. 286–288, 1 map, 1939. [Mimeographed.]

Between 1st January and 9th September, 1939, confirmations of the spread of Dutch elm disease (*Ceratostomella ulmi*) extended the main infected area round New York Harbour [cf. *R.A.M.*, xviii, p. 641] into five further counties, namely, two in Pennsylvania, and one each in Connecticut, New York, and New Jersey. The present distribution of the disease is indicated on a map accompanying the paper.

Goidànich (G.) & Azzaroli (F.). **Relazione sulle esperienze di selezione di Olmi resistenti alla grafiosi e di inoculazioni artificiali di 'Graphium ulmi' eseguite nel 1938.** [An account of experiments on the selection of Elms resistant to graphiosis and of artificial inoculations with *Graphium ulmi* carried out in 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 2, pp. 222–240, 4 figs., 1939.

In further inoculation experiments carried out in Italy in 1938 to determine the reaction of different elm selections to graphiosis [*Ceratostomella ulmi*: *R.A.M.*, xviii, pp. 213, 641] the resistance of *Ulmus pumila* was confirmed; of 52 inoculated trees of different ages and growing under different conditions not one died, the great majority remained perfectly healthy, and a few showed very slight symptoms. A strain of *U. campestris*, referred to as Villagrappa 3, also showed a high degree of resistance. *U. laevis*, which had previously shown resistance [ibid., xvii, p. 636], became heavily infected. Hybrids of *U. pumila* derived from crosses with *U. campestris* and *U. montana* showed marked resistance. Outstanding resistance was again shown by the C. Buisman elm [loc. cit.] grafted on *U. hollandica* or *U. pumila*. This variety is well suited for use as vine supports and appears to flourish under Italian

conditions. Evidence was obtained that to maintain the resistance of an elm used for grafting the grafts must be made on a resistant stock.

PEYRONEL (B.). **L'eterotallismo quale possibile causa della mancata o ritardata produzione della forma ascofora in talune Erisifaceae di origine esotica.** [Heterothallism as a possible cause of the absence or delayed production of the ascigerous stage in some Erysiphaceae of exotic origin.]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 316–319, 1939.

Discussing the spread throughout Europe of *Uncinula necator* on the vine and *Microsphaera quercina* on the oak [*R.A.M.*, xix, p. 49], data on which are given, the author calls attention to the retarded appearance of the perithecial stages of these fungi. He puts forward the hypothesis that the species in question are heterothallic and that both + and − sexual types become diffused at different times across Europe or are introduced at successive periods from America, or that one spreads more rapidly than the other, owing perhaps to a more abundant production of conidia. When the mycelia of opposite sexes meet perithecia are formed, provided the condition of the host and the climatic factors permit.

GEORGESCU (C.) & BADEA (M.). **Uscarea puieților de Quercus rubra.** [The dying-off of Red Oak seedlings.]—*Rev. Pădurilor*, li, 9, pp. 717–719, 2 figs., 1939. [French summary.]

Red oak (*Quercus rubra*) seedlings in two stands near Bucharest have been dying off as a sequel to combined infection by *Aposphaeria allantella* (Sacc. & Roum.) [Sacc.] and a bacterium to be described in a future communication. The spheroidal pycnidia of the fungus measure 104 μ in height and 150 to 160 μ in diameter, and the hyaline, cylindrical spores 4 by 1 μ.

HERRICK (J. A.). **The growth of Stereum gausapatum Fries in relation to temperature and acidity.**—*Ohio J. Sci.*, xxxix, 5, pp. 254–258, 1939.

In this further study on *Stereum gausapatum* [*R.A.M.*, xviii, p. 718], a major cause of heart rot of oaks in the United States, it is stated that the fungus grew best in tests on potato dextrose and malt agars at a temperature of 25° C., while very little growth occurred at the two extremes of the experimental range, namely, 5° and 35°. The optimum P_H value for growth, using potato dextrose agar as the medium, was 4·6, but considerable growth took place from 2·8 to 7·6, though none occurred at 2·0 and 8·2. There was no indication of an isoelectric point.

CAMPBELL (W. A.) & DAVIDSON (R. W.). **Sterile conks of Polyporus glomeratus and associated cankers on Beech and Red Maple.**—*Mycologia*, xxxi, 5, pp. 606–611, 2 figs., 1939.

In 1938, sterile conks of a fungus identified from pure culture isolations as *Polyporus glomeratus* [*R.A.M.*, xviii, p. 487], with or without associated cankers, were common on beech in the Green Mountain National Forest, Vermont. The conks were obtuse-elongated or flattened, dark brown to black, roughened on the surface, and resembling those on birch due to *Poria* (?) *obliqua* [ibid., xix, p. 56], except for their smaller size (rarely protruding more than 3 in.). They frequently formed at old, unhealed branch stub openings and in time a definite canker

developed on the trunk above the stub. Sterile fungus material was deposited on the surface of the canker. On old trees the cankers were often as much as 2 ft. in length. *Polyporus glomeratus* rarely fruits on living trees but sporophores develop on fallen logs after several years. Sterile conks were also found on beech in New Hampshire and one each in Pennsylvania and Maine.

P. glomeratus was also associated with cankers on red maple (*Acer rubrum*) in New Hampshire and Vermont (less commonly in Connecticut and Pennsylvania), particularly in connexion with old branch stubs. Such cankers showed a hypertrophied margin and depressed centre, which was filled with a crust-like deposit of fungus material. Protruding sterile conks were rare, but occasionally a flattened, solid mass of fungus material was formed. The fungus was successfully isolated from the sterile conks and decayed wood. It is evidently an important agent of decay of red maple and has also been collected on sugar maple (*A. saccharum*) in Maine.

Hedgcock (G. G.). **Notes on the occurrence of Coleosporium in the south-eastern United States during 1938 and 1939.**—*Plant Dis. Reptr*, xxiii, 16, pp. 268–277, 1939. [Mimeographed.]

Data are given in tabular form on the occurrence and time of fruiting of species of *Coleosporium* found in Florida and other south-eastern regions of the United States in 1938 and 1939. In these localities, the pycnidia appear in December on the aecidial hosts represented by various species of *Pinus*. In Florida they become mature in January or February, preceding the aecidia by at least one month. The first aecidia to appear belong to *C. vernoniae* [*R.A.M.*, xviii, p. 424] and *C. apocynaceum*; these are followed a week or two later by those of *C. minutum*, and after two or three weeks by those of *C. elephantopodis* [ibid., xiii, p. 201] and *C. helianthae*, those of *C. ipomoeae* [ibid., vii, p. 538] and *C. laciniariae* [ibid., xiii, p. 201] appearing about a month later. Along the northern border in the eastern United States both pycnidia and aecidia appear at least two months later than in Florida. *C. solidaginis* [ibid., xvii, pp. 360, 602] produces no teleutosori in Florida, except possibly a few along the northern border, overwintering in the uredo stage. At higher altitudes and in cooler climates in the adjacent States north of Florida the teleutosori of *C. solidaginis* are often abundantly present.

Ehrlich (J). **A preliminary study of root diseases in western White Pine.**—*Sta. Pap. North. Rocky Mount. For. Range Exp. Sta., Missoula, Mont.* (*For. Serv. U.S. Dep. Agric.*), 1, 10 pp., 1 pl., 2 graphs, 1939. [Mimeographed.]

Of 52 isolates from root rots of western white pine (*Pinus monticola*) made in the summer of 1938 in the course of an intensive study of the incidence, importance, and identity of these diseases in four areas representing the 10- to 200-year age-groups in the Coeur d'Alene National Forest, Idaho, 31 were determined as *Armillaria mellea* [*R.A.M.*, viii, p. 682], 10 as *Fomes annosus* [ibid., x, p. 571], and 11 unspecified.

Of all the trees examined, 59 per cent. were infected at or near the

root-collar, the relative proportions of *A. mellea* and *F. annosus* being 85 and 13 per cent., respectively. Only in 16 per cent. of the trees, however, did the circumference of the collar killed amount to half or more, involving death in the near future. Analyses of cambial activity by five-year periods extending back for 25 years revealed no substantial reduction of increment in trees with less than 25 per cent. of the bared root surface infected. With 26 to 50 per cent. infection there was a significant fall in the extent of new growth, while over 50 per cent. was associated with a consistent reduction throughout the period covered.

Root rots were found to be more prevalent on poor than on fair or good sites and on short than on tall trees in the same age-group. Wet situations appeared to favour vigorous growth and consequent ability to resist infection. The degree of root infection was closely reflected in the colour of the foliage and to a somewhat lesser extent in crown density. Of the trees without ascertained root infection, 97 per cent. bore healthy green foliage and none showed any appreciable amount of brown leaves, whereas no healthy green was shown by the trees with more than half the root-collar circumference killed, and the foliage of the two trees in which the root-collars were completely destroyed was mostly brown. Of the apparently sound trees, 82 per cent. had dense to medium crowns and the rest open or ragged ones, while both those with the root-collars entirely killed showed ragged crowns; leaf colour thus furnished a moderately reliable measure of the extent of root infection, and crown density a less dependable gauge; neither feature affords an exact criterion of absolute infection. No evidence was obtained that root infection increases the likelihood of attack by the mountain pine beetle (*Dendroctonus monticolae*), but there was an indication that infection may take place and spread rapidly following beetle attack.

Leutritz (J.). **Acceleration of toximetric tests of wood preservatives by the use of soil as a medium.**—*Phytopathology*, xxix, 10, pp. 901–903, 1939.

In the course of laboratory experiments at Summit, New Jersey, in which blocks of *Pinus echinata* sapwood were exposed to contact with termites (*Reticulitermes flavipes*) in rich garden soil, every specimen was found after two months to show extensive fungal decay. In order to test the possibility that any particularly virulent organism was responsible for the attack, untreated blocks of the same pine species were covered with soil of 20 per cent. moisture content placed in bottles, sterilized and inoculated with pure cultures of *Fomes roseus*, *Polyporus vaporarius* [*Poria vaporaria*], and *P. incrassata*, a comparative series being set up at the same time subject to the standard technique developed at the Bell Telephone Laboratories [*R.A.M.*, xvii, p. 785]. After 16 weeks the loss of weight due to *F. roseus* ranged from 30 to 34·7 by the new and 11 to 11·8 per cent. by the old method, the corresponding figures for *P. vaporaria* [ibid., xix, p. 55] being 37·8 to 41·8 and 10·9 to 12·7 and for *P. incrassata* 47·5 to 47·8 and 13·9 to 14·4, respectively. These data not only illustrate the high degree of uniformity and rapidity of invasion obtainable by the new method of testing, but also represent the maximum incidence of rot on untreated control specimens hitherto secured in the writer's studies on the protection of

wood against fungi of the dry rot type. Although the improved moisture control of the new technique may be the sole cause of the acceleration of rotting [ibid., xviii, p. 775], there is a possibility that this desirable effect results in part from the presence in the soil of organic or inorganic nutrilites.

FLACHS (K.) & WALTER (M.). **Studien über die Lebensbedingungen des Pilzes Monilia fimicola Cost. et Matt. und seine Beziehungen zum Champignon.** [Studies on the conditions of existence of the fungus *Monilia fimicola* Cost. & Matt. and its relations to the edible Mushroom.]—*Prakt. Bl. Pflanzenb.*, xvii, 3–4, pp. 98–114, 8 figs., 1939.

A severe epidemic of the 'white plaster mould' (*Monilia* [*Oospora*] *fimicola*) [*R.A.M.*, xviii, p. 88] of edible mushrooms [*Psalliota* spp.] in the Munich district of Germany in 1935–6 afforded an opportunity for a comprehensive investigation of the disease. The fungus was studied both in pure culture on a variety of media and in experimental mushroom beds. The optimum temperature for the growth of *O. fimicola* was about 18° to 20° [C.] and the optimum, maximum, and minimum hydrogen-ion concentration P_H 6·44 to 7, 4, and 8, respectively.

O. fimicola was found to act, not only as a true parasite, but also as a nitrogen-consumer, withdrawing sustenance from its host, to which it is, moreover, greatly superior in respect of adaptability to temperature and moisture conditions. The composition of the compost applied to the mushroom beds is of special significance both for host and pathogen, the former benefiting by an admixture of oats and wheat and the latter by that of sugar beets. In practice it has been found that the inclusion of beets in horse fodder exerts an adverse effect on the mushroom crop. A close connexion was also established between mushroom development and active nitrification of the soil.

Once the fungus has gained a foothold in the beds its elimination is impracticable, and preventive measures thus constitute the only hope of control. Foremost among these is the thorough cleansing of the cellars by sprinkling with a 2 per cent. formalin solution before the introduction of the spawn. The compost should be thoroughly heated, sufficiently rotted, and not too abruptly cooled off. The casing soil should be neutral or slightly acid, of a texture permitting the retention of moisture for a considerable period and enabling the mushroom mycelium rapidly to push its way upwards. Care must be taken to provide proper ventilation, while avoiding draughts and sudden fluctuations of temperature.

Modification of Dutch Elm disease quarantine regulations.—U.S.D.A., B.E.P.Q., 2 pp., 1939.

Amendment No. 4 (effective as from 11th September, 1939) to the rules and regulations supplemental to Notice of Quarantine No. 71 [*R.A.M.*, xiv, p. 480], relating to the embargo on the inter-State movement of elm material from specified areas in Connecticut, New York, and New Jersey on account of the elm disease [*Ceratostomella ulmi*], adds a number of new areas in the three States to those already regulated for this purpose, and records the appearance of the disease in two counties of Pennsylvania [see above, p. 124].